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THE TEMPERATURE OF MEXICO

By Jesus Hernandez, B. C. E.

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SUPPLEMENTS TO THE MONTHLY WEATHER REVIEW.

During the summer of 1913 the issue of the system of publications of the Department of Agriculture was changed and simplified so as to eliminate numerous independent series of bureau bulletins. In accordance with this plan, among other changes, the series of quarto bulletins—lettered from A to Z—and the octavo bulletins—numbered from 1 to 44—formerly issued by the U. S. Weather Bureau have come to their close.

Contributions to meteorology such as would have formed bulletins are authorized to appear hereafter as Supplements of the MONTHLY WEATHER REVIEW. (Memorandum from the Office of the Assistant Secretary, May 18, 1914.)

These Supplements comprise those more voluminous studies which appear to form permanent contributions to the science of meteorology and of weather forecasting, as well as important communications relating to the other activities of the U. S. Weather Bureau. They appear at irregular intervals as occasion may demand, and contain approximately 100 pages of text, charts, and other illustrations.

Owing to necessary economies in printing, and for other reasons, the edition of SUPPLEMENTS is much smaller than that of the MONTHLY WEATHER REVIEW. SUPPLEMENTS will be sent free of charge to cooperating meteorological services and institutions and to individuals and organizations cooperating with the bureau in the researches which form the subject of the respective supplements. Additional copies of this SUPPLEMENT may be obtained from the Superintendent of Documents, Washington, D. C., to whom remittances should be made.

The price of this Supplement is 10 cents.

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CONTENTS.

LIST OF TABLES.

ILLUSTRATIONS.

TEMPERATURE IN MEXICO.

By Jesus Hernandez, B. C. E.

[Dated Aug. 31, 1921.]

[Manuscript text in Spanish translated by W. W. Reed, Weather Bureau, Washington, D. C., July 5, 1923.]

PART I.—DISTRIBUTION OF TEMPERATURE IN THE REPUBLIC OF MEXICO.

Although it lies mostly within the tropical zone the territory of the Republic of Mexico presents great diversity of climate from severe cold to extreme heat. This variation in climate is due, first, to the highly varied topography of the country and, second, to the proximity of the thermal equator, which in this region of the earth moves north as far as the parallel of 15° N., thereby giving rise to a temperature gradient abnormal for latitude.

From the topographical point of view the presence of elevated plains (*mesetas*) of considerable extent is to be taken into consideration. These elevated plains, especially the *Mesa Central*, although their mean elevation above sea-level is about 2,000 meters, are separated from the coast by relatively short distances; there are steep slopes in the terrain with marked differences in temperature regimen.

At times the distance of some hundreds of meters is sufficient for one to experience a change to very different climate. This condition is found chiefly in Vera Cruz, Morelos, and Chiapas. Within the last-named State alone, notwithstanding the fact that its area is relatively small, there is observed what is noted in general for all the country—that is, great diversity in temperature.

In a general way it can be stated that the Republic of Mexico has three great thermal divisions, as shown in Figure 2.

The hot zone (*zona calida*) encircles the country along the coasts and in addition wholly includes the Isthmus of Tehuantepec, the States of Tabasco and Campeche, and the Peninsula of Yucatan; it has a mean temperature of 22.5° C. (72.5° F.).

The temperate zone (*zona templada*) with a mean temperature between 15.0° C. (59.0° F.) and 22.5° C. (72.5° F.) occupies an immense area stretching from the plains of the north (*llanuras*) to the arable lands (*campiñas*) of the interior and southern regions as far as Puebla and Oaxaca. In Chiapas there is a secondary temperate zone, which undoubtedly must extend into the Republic of Guatemala. The temperatures for California (San Diego, 16.0° C. or 60.8° F.) lead to the inference that a small part of northwestern Lower California is included within the temperate zone, as is indicated on Figure 2.

The cold zone (*zona fria*) is shown by the presence of small areas in the elevated regions of the country—one situated between the States of Zacatecas and San Luis; another comprising the valleys of Mexico, Toluca, Tula, Pachuca, Chignahuapan, and the large valley that includes the whole State of Tlaxcala and part of Puebla, and yet another in the elevated regions of Chiapas.

In the studies contained in this work use has been made of data from 70 meteorological stations. Figure 1 gives the distribution of these stations.

In the temperature tables the arrangement of the stations is an alphabetical one. For convenience in consulting the data a grouping is made in the subjoined table showing the stations by States, the arrangement of both the States and stations within them being alphabetical.

Table No. 0.—*States and stations arranged alphabetically.*

States and stations.	North latitude.	West longitude (Greenwich).	Elevation.
Chiapas.	°	°	*Meters.*
Comitan	16.2	92.1	1,635
San Cristobal	16.7	92.6	2,118
Tapachula	14.9	92.3	187
Tuxtla Gutierrez	16.6	93.1	536
Chihuahua.			
Chihuahua	28.6	106.1	1,423
Juarez [1]	31.7	106.5	1,134
Ojinaga	29.6	104.4	806
Parral	26.9	106.0	1,730
Coahuila.			
Piedras Negras	28.7	100.5	221
Saltillo	25.4	101.0	1,605
Sierra Mojada	27.3	103.7	1,528
Torreon	25.6	103.4	1,135
Colima.			
Colima	19.2	103.7	507
Manzanillo	19.0	104.3	4
Durango.			
Durango	24.0	104.6	1,903
Federal District.			
Mexico	19.4	99.1	2,259
Guanajuato.			
Guanajuato	21.0	101.3	2,037
Leon	21.1	101.6	1,809
Hidalgo.			
Huejutla	21.1	98.4	316
Pachuca	20.1	98.7	2,436
Zacualtipan	20.5	98.6	2,024
Jalisco.			
Ahualulco	20.8	103.9	1,325
Autlan	19.5	104.5	1,003
Colotlan	22.6	103.6	1,683
Guadalajara	20.7	103.4	1,558
Guzman [1]	19.6	103.5	1,529
La Barca	20.3	102.5	1,532
Lagos	21.4	101.9	1,872
Mascota	20.6	104.7	1,238
Teocaltiche	21.2	102.3	1,724
Toluca	19.3	99.7	2,676
Valle de Bravo	19.2	100.0	1,825
Michoacan.			
Morelia (Observatorio)	19.7	101.1	1,925
Morelia (Seminario)	19.7	101.1	1,933
Morelos.			
Cuernavaca	18.9	99.2	1,540
Nayarit.			
Tepic	21.5	105.0	930
Nuevo Leon.			
Lampazos	27.0	100.5	317
Monterrey	25.7	100.3	533
Oaxaca.			
Oaxaca	17.1	96.7	1,563
Pochutla	15.7	96.5	165
Salina Cruz	16.2	95.2	56
Silacayoapan	17.5	98.2	1,635
Tuxtepec	18.1	96.1	25
Puebla.			
Chignahuapan	19.9	98.0	2,270
Puebla	19.0	98.1	2,150
Queretaro.			
Queretaro	20.6	100.3	1,842
Quintana Roo.			
Isla Mujeres	21.1	86.7	0
Vigia Chico	19.8	87.6	0
Xkalak	18.2	87.8	0

[1] Station listed in tables with "C" (*Ciudad*, City) prefixed

TABLE No. 0.—*States and stations arranged alphabetically*—Continued.

States and stations.	North latitude.	West longitude (Greenwich).	Elevation.
San Luis Potosi.	°	°	*Meters.*
San Luis Potosi	22.2	101.0	1,887
Sinaloa.			
Culiacan	24.8	107.3	53
Fuerte	26.5	108.7	102
Mazatlan	23.1	106.4	78
Sonora.			
Guaymas	27.9	110.9	9
Hermosillo	29.1	110.9	218
Tabasco.			
San Juan Bautista	18.0	92.9	22
Tamaulipas.			
Rio Bravo	26.0	98.1	30
Tampico	22.2	98.0	24
Victoria [1]	23.7	99.1	324
Tlaxcala.			
Tlaxcala	19.3	98.2	2,240
Vera Cruz.			
Jalapa	19.5	96.9	1,399
Ulua (Vera Cruz)	19.2	96.1	12
Yucatan.			
Izamal	20.9	89.0	16
Maxcanu	19.8	90.5	12
Merida	21.0	89.6	22
Peto	20.0	88.9	36
Progreso	20.6	90.0	15
Valladolid	20.7	88.2	22
Zacatecas.			
Zacatecas, Bufa	22.6	102.6	2,611
Zacatecas, Instituto	22.6	102.6	2,443

[1] Station listed in tables with "C" (*Ciudad*, City) prefixed.

At Zacatecas there are two stations; one at the *Instituto del Estado* at an elevation of 2,443 meters and the other on the crest of Bufa Hill at 2,611 meters; at Morelia, also, two stations, located, one at the *Seminario Conciliar* and another at the *Observatorio del Estado*, at elevations of 1,925 and 1,933 meters, respectively.

In the Meteorological Service (*Red Meteorologica*) two different systems of observations, including observations of temperature, have been followed—one system with the hours of 7 a. m., 2 p. m., and 9 p. m. local time, the other with the hours corresponding to 8 a. m. and 8 p. m. 75th meridian time.

In order to obtain uniformity relative to the length of series for the stations it has been necessary to reduce the observations to an epoch of 10 years, employing the method used by Angot.[1]

The practical use of this method consists in classifying the stations as having continuous observations during the period to which reduction is made or as having the corresponding series incomplete. The latter series of observations are those subject to reduction, which is effected by selecting for each of these stations the greatest possible number of comparative stations, choosing those that are nearest. When the relation between the comparative stations in the years in which data are available for both has been established, the resulting corrections when applied to the normal values of the stations used for comparison will give new values which will show very small discrepancies. The mean of these last values will be the final result of reduction.

[1] A Angot, Etudes sur le climat de la France. Annales du Bureau Central 1902. 1 Mémoires.

A simple process of reasoning will demonstrate that this method of reduction has a mathematical basis, being entirely an application of ratios.

Since the explanation of the operations in this reduction is rather lengthy, only an example is given, the reduction for the station Morelia (*Seminario*), where observations ended in 1907. This reduction is for the system 7a., 2p., and 9p., in the month of March. (Table 1.)

TABLE 1.—*Reduction of temperature to the epoch 1901–1910.*

[Morelia (*Seminario*), Michoacan, month of March. Mean temperature, 16.5° C. observations at 7 a., 2 p., 9 p. Figures without sign are positive.]

Comparative stations.	Differences.										Mean difference.	Comparative temperature.	Reduction.
	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910			
Guadalajara	−1.4	−3.0	−3.6	−2.7	−2.6	−1.8	−2.5	....	....	....	−2.5	19.3	16.8
Guanajuato	−0.9	−2.6	−2.9	−1.0	−1.3	−1.6	−0.8	....	....	....	−1.6	18.3	16.7
Leon	−0.7	−2.3	−2.7	−1.3	−2.3	−0.9	−1.9	....	....	....	−1.7	18.7	17.0
Queretaro	−0.6	−2.4	−1.3	−2.0	−1.4	−0.5	−1.0	....	....	....	−1.3	17.8	16.5
Toluca	4.0	2.3	4.6	3.7	3.6	5.8	5.3	....	....	....	4.2	12.4	16.6

Reduced temperature, 16.7° C.

It is seen that the reduced temperature for this station in the month of March is 16.7° C., which corresponds to the normal for the period 1901–1910 instead of 16.5° C., which is the mean for the years 1901–1907.

In the *Observatorio Central de Mexico* reductions have been made in this manner of all the observations of the Meteorological Service, separately for 8 a. m., 8 p. m. and for the combination 7 a. m., 2 p. m., 9 p. m.

To avoid useless repetition there have been adopted the following simplified notations for the systems of observation, they will be distinguished thus:

System: $\frac{7\text{ a. m.}+2\text{ p. m.}+9\text{ p. m.}}{3}$ 7, 2, 9

System: $\frac{7\text{ a. m.}+3\text{ p. m.}+11\text{ p. m.}}{3}$ 7, 3, 11

System: $\frac{8\text{ a. m.}+8\text{ p. m.}}{2}$ 8, 8

System: $\frac{\text{maximum}+\text{minimum}}{2}$ .... max., min.

In Mexico it has been customary to take as daily means of temperature the average values from the systems 7, 2, 9; max., min., or even that of 8, 8; which latter falls far short of giving the accuracy required in monthly and annual values. The corrections that recent studies have revealed may exceed 1.5° C. in not a few cases, as will be seen later.

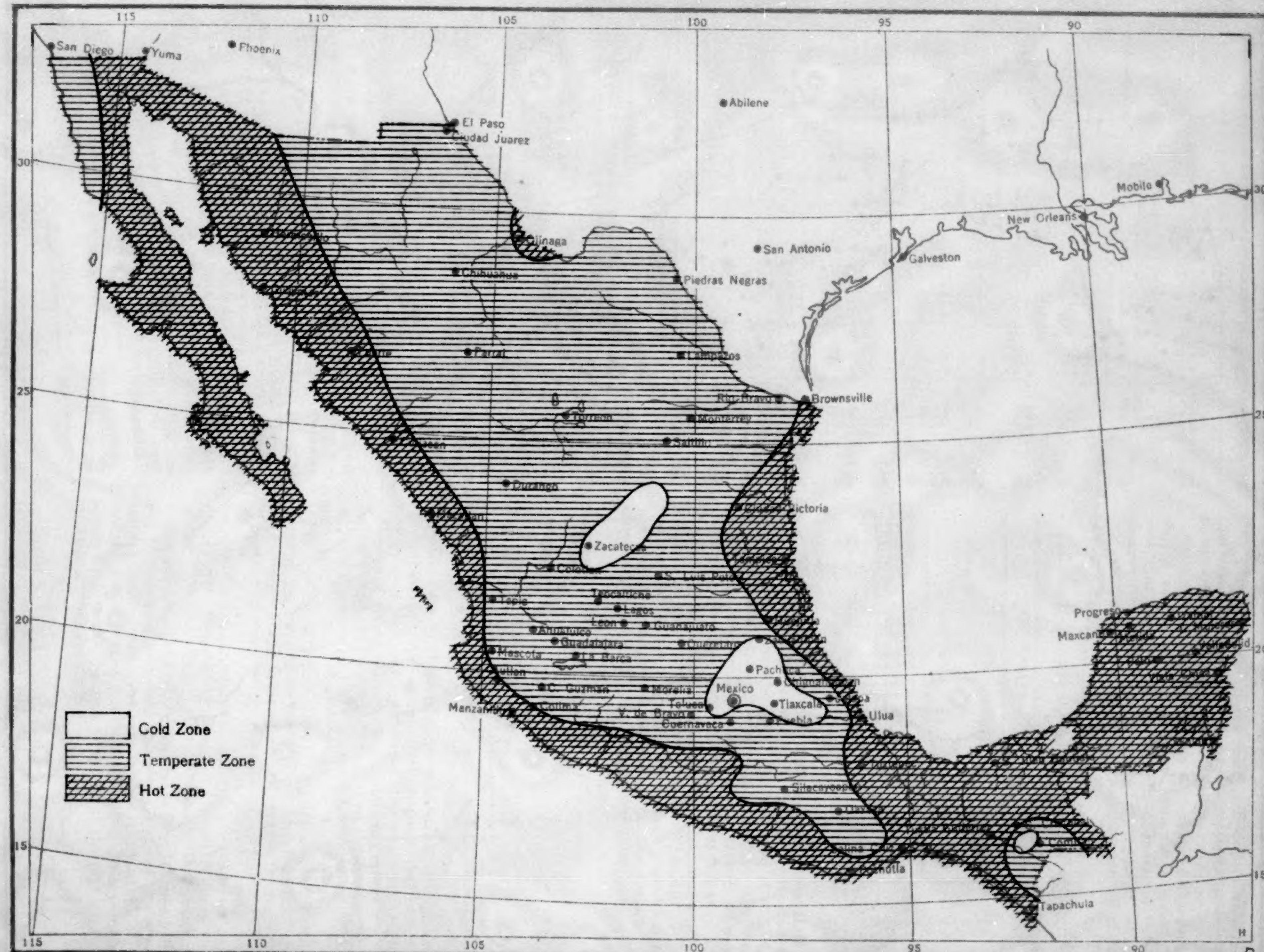
For the City of Mexico, the only station at which hourly observations have been made, the corrections that are to be applied in the different cases to obtain the mean of 24 observations are (in annual means) the following:

For 7, 2, 9........................−0.34° C.
For max., min.....................−0.74
For 8, 8...........................+1.16

This subject will be fully discussed in Part III, in which will be found hypothetical values (in view of the very indirect method employed in their reduction), of the corrections necessary in order to obtain with a certain approximation the theoretical values of the true means for 24-hourly observations.

Fig. 1. Location of temperature stations in Mexico.

Fig. 2. Thermal divisions of Mexico.



However, the general annual march of temperature is not greatly affected by the lack of reduction of the observations to the mean of 24 hours, if there is employed in the study the system 7, 2, 9, which is the one most closely approximating that of 24-hourly values; hence the corresponding monthly means can be taken in studies that do not require great accuracy, such as the annual temperature march viewed in a general way.

In view of the above there have been constructed from the data of the 7, 2, 9 system the charts reproduced as Figures 3–14 from the numerical values which appear in Tables 3 and 4.

Figures 3–14 give the temperature variations from month to month—that is, the differences in the values for successive months, and in Figure 15 the amplitudes of the extreme monthly values are shown. Figure 16 indicates the different months in which the extremes occur.

Entirely in agreement with the diversity of climate existing in the country, the annual temperature variation is observed in the most varied forms possible, there are noted, without definite relation, types that are tropical, maritime, Continental-tropical, and Continental-temperate.

If a general survey is made of the temperature values for each of the stations in the system (Table 2 and Figs. 20–32) it will be seen that the annual variation appears to be affected mainly by geographic position and Continental location. Under Continental location are included elevation and relative distance from the seas.

The vicinity of the sea generally gives very symmetrical curves, in which the analytical method of study makes almost no change; as typical there can be taken the temperature march at Ulua (Vera Cruz), where the monthly departures from the annual mean are practically alike during annual rise and fall, as is seen from the following:

	°C.		°C.
January (min.)	−3.5	July (max.)	2.2
February	−3.1	August	2.3
March	−1.3	September	1.8
April	0.6	October	0.7
May	1.8	November	−1.1
June	2.3	December	−3.1

With advance from the northern frontier toward lower latitudes the annual variation in temperature undergoes a continual change that in the end results in types of annual variation peculiar to the equatorial regions. In summer (*verano*) there are observed at first very small variations from month to month. Later they not only become zero, but show a change in sign to negative, with a temperature fall toward the middle of the year that is more considerable the lower the latitude, until at the most southern stations of the country there is clearly defined the presence of two maxima and two minima. If, on the other hand, comparison is made of the types of annual variation with regard to distance from the seas and consequent elevation above sea level, it will be seen that the relative harmony in annual march in temperature that makes itself more noticeable as the latitude becomes lower disappears.

An attempt will be made to explain in detail the causes that produce these phenomena, which, studied from another point of view, can serve as the basis in the solution of various problems in meteorology.

TABLE 2.—*Monthly and annual mean temperatures (°C.) reduced to the epoch 1901–1910.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Ahualulco:													
8 a. m.	9.9	10.4	12.1	14.7	18.1	19.2	18.7	18.4	18.1	16.7	12.9	10.7	15.0
8 p. m.	20.3	21.8	24.6	27.2	27.9	26.2	25.0	24.2	24.0	23.8	22.1	20.0	23.9
8, 8	15.1	16.1	18.4	21.4	23.0	22.7	21.8	21.3	21.0	20.2	17.5	15.4	19.5
7, 2, 9	16.3	17.3	19.7	22.4	24.0	23.2	22.4	22.0	21.9	21.0	18.1	16.4	20.4
Autlán:													
8 a. m.	13.7	15.0	17.2	19.3	20.9	21.8	20.8	19.9	19.6	18.6	15.6	14.0	18.0
8 p. m.	21.2	21.6	23.7	25.6	26.6	26.9	25.2	23.6	23.3	23.1	22.0	21.2	23.7
8, 8	17.4	18.3	20.5	22.4	23.8	24.4	23.0	21.8	21.4	20.8	18.8	17.6	20.8
7, 2, 9	19.8	20.5	22.4	24.7	26.0	26.1	24.6	23.2	23.0	22.5	21.2	20.1	22.8
C. Guzmán:													
8 a. m.	9.8	11.0	12.8	14.5	16.4	18.0	17.3	16.9	16.3	15.3	13.4	10.8	14.4
8 p. m.	19.0	20.4	21.9	23.3	24.1	22.5	21.2	21.1	21.0	20.9	20.4	18.8	21.2
8, 8	14.4	15.7	17.4	18.9	20.2	20.2	19.2	19.0	18.6	18.1	16.9	14.8	17.8
7, 2, 9	16.2	17.5	19.8	21.8	22.6	21.8	20.7	20.4	20.4	20.0	18.0	16.3	19.6
C. Juárez:													
8 a. m.	1.5	3.5	7.5	11.9	16.5	20.7	21.5	20.7	17.6	11.3	5.7	2.0	11.7
8 p. m.	9.8	12.5	16.5	21.1	26.4	29.2	29.4	27.9	25.0	20.2	13.9	8.8	20.1
8, 8	5.6	8.0	12.0	16.5	21.4	25.0	25.4	24.3	21.3	15.8	9.8	5.4	15.9
7, 2, 9	6.9	9.6	13.5	17.7	22.9	26.6	27.6	26.1	22.2	16.3	10.4	6.2	17.2
C. Victoria:													
8 a. m.	11.6	13.2	16.6	20.1	22.5	24.2	24.1	24.2	22.6	19.9	15.8	13.0	19.0
8 p. m.	17.8	20.0	24.4	27.6	29.4	30.6	28.7	30.1	28.1	24.2	20.4	17.8	24.9
8, 8	14.7	16.6	20.5	23.8	26.0	27.4	26.4	27.2	25.4	22.0	18.1	15.4	22.0
7, 2, 9	16.4	18.2	22.0	25.2	27.4	28.7	27.9	29.0	27.2	23.2	19.1	16.4	23.4
Colima:													
8 a. m.	16.2	16.3	16.8	18.1	20.3	22.2	21.7	21.3	21.0	19.9	18.0	16.8	19.0
8 p. m.	24.1	24.5	25.7	26.9	27.0	26.4	25.4	25.0	24.9	24.8	24.6	23.6	25.2
8, 8	20.2	20.4	21.4	22.5	23.6	24.3	23.6	23.2	23.0	22.4	21.3	20.2	22.2
7, 2, 9	21.7	22.2	23.5	24.7	26.1	25.9	24.8	24.6	24.5	24.2	23.4	21.8	24.0
Colotlán:													
8 a. m.	7.0	8.2	11.1	13.7	16.6	19.3	17.8	17.1	15.9	13.9	10.4	6.7	13.1
8 p. m.	18.8	20.4	23.8	25.9	27.6	27.8	24.8	23.5	23.4	23.5	20.7	18.4	23.2
8, 8	12.9	14.3	17.4	19.8	22.1	23.6	21.3	20.3	19.6	18.7	15.6	12.6	18.2
7, 2, 9	14.2	16.5	19.5	21.7	23.7	24.9	22.8	22.0	21.6	20.3	17.0	13.8	19.8
Comitán:													
8 a. m.	11.5	12.4	14.0	15.7	16.2	15.9	15.3	15.3	15.7	15.5	14.2	12.7	14.5
8 p. m.	15.6	16.1	18.4	20.3	20.1	19.3	18.6	18.4	18.5	18.6	17.7	16.4	18.2
8, 8	13.6	14.2	16.2	18.0	18.2	17.6	17.0	16.8	17.1	17.0	16.0	14.6	16.4
7, 2, 9	15.5	16.6	18.1	19.4	20.4	19.6	18.4	18.4	18.8	18.0	16.6	15.7	18.0
Cuernavaca:													
8 a. m.	14.2	15.1	16.5	18.0	19.0	18.3	17.4	17.2	17.1	16.4	15.1	14.5	16.6
8 p. m.	20.2	22.3	24.6	26.6	25.5	23.5	22.1	21.6	21.4	21.2	20.2	19.1	22.4
8, 8	17.2	18.7	20.6	22.3	22.2	20.9	19.8	19.4	19.2	18.8	17.8	16.8	19.5
7, 2, 9	18.2	19.4	21.4	23.4	22.9	21.3	20.3	19.9	19.8	19.9	19.3	18.1	20.3
Culiacán:													
8 a. m.	14.3	14.3	15.3	17.3	20.9	24.7	25.6	25.4	24.6	21.8	17.6	14.4	19.7
8 p. m.	23.6	24.2	26.0	28.0	30.0	31.6	30.7	29.7	29.7	28.6	25.4	23.0	27.5
8, 8	19.0	19.2	20.6	22.6	25.4	28.2	28.3	27.6	27.2	25.2	21.5	18.7	23.6
7, 2, 9	20.5	20.5	22.3	24.4	26.8	29.5	29.2	28.4	28.1	26.4	23.1	20.0	24.9
Chignahuapan:													
8 a. m.	4.2	5.0	6.7	9.3	11.4	11.3	10.7	10.3	10.0	8.8	6.6	4.8	8.3
8 p. m.	9.6	10.8	12.9	14.6	15.4	14.9	14.0	14.1	13.5	11.8	10.3	9.2	12.6
8, 8	6.9	7.9	9.8	12.0	13.4	13.1	12.4	12.2	11.8	10.3	8.4	7.0	10.4
7, 2, 9	8.5	9.8	11.8	14.3	15.6	15.1	14.5	14.4	13.8	12.2	10.5	9.2	12.5
Chihuahua:													
8 a. m.	5.3	7.0	10.4	14.0	17.3	21.3	21.0	20.2	18.0	12.8	8.0	4.2	13.3
8 p. m.	14.9	16.3	21.0	25.0	30.8	29.8	28.0	27.0	25.3	22.7	16.7	13.7	22.6
8, 8	10.0	11.6	15.7	19.5	24.0	25.6	24.5	23.6	21.6	17.8	12.4	9.0	17.9
7, 2, 9	10.9	12.2	16.2	20.0	24.6	26.3	24.9	24.1	22.1	18.5	13.2	10.0	18.6
Durango:													
8 a. m.	6.4	7.5	10.2	12.6	14.7	16.6	16.5	15.8	14.5	11.1	8.0	6.2	11.7
8 p. m.	15.5	18.5	21.5	23.3	24.7	25.0	23.2	21.6	20.4	19.6	17.9	16.6	20.6
8, 8	11.0	13.0	15.8	18.0	19.7	20.8	19.8	18.7	17.4	15.4	13.0	11.1	16.1
7, 2, 9	12.5	14.2	17.4	19.4	21.2	22.6	21.6	20.5	19.1	17.4	14.9	13.0	17.8
Fuerte:													
8 a. m.	9.5	9.7	12.6	14.8	18.6	24.0	25.3	24.4	23.8	19.3	14.3	10.2	17.2
8 p. m.	24.0	24.8	26.9	29.9	32.6	34.7	32.1	30.8	30.5	29.8	26.8	23.0	28.8
8, 8	16.8	17.2	19.7	22.2	25.6	29.4	28.7	27.6	27.1	24.6	20.4	16.6	23.0
7, 2, 9	18.6	18.6	21.6	24.0	27.4	30.6	29.6	28.3	28.0	25.4	21.1	17.9	24.3
Guadalajara:													
8 a. m.	10.1	10.8	12.7	15.4	17.4	18.6	17.8	17.3	16.7	14.9	12.7	10.5	14.6
8 p. m.	19.6	21.5	23.8	26.1	27.6	25.8	23.7	22.6	22.2	22.0	21.2	19.3	23.0
8, 8	14.8	16.2	18.2	20.8	22.5	22.2	20.8	20.0	19.4	18.4	16.8	14.9	18.8
7, 2, 9	15.4	17.0	19.3	21.9	23.3	22.8	21.5	20.8	20.5	19.6	17.8	15.8	19.6
Guanajuato:													
8 a. m.	7.9	9.1	11.4	13.9	15.8	15.3	14.6	14.4	13.9	12.4	10.5	8.8	12.3
8 p. m.	16.0	18.4	20.8	23.2	23.8	22.4	20.9	20.5	20.4	19.2	17.6	16.1	19.9
8, 8	12.0	13.8	16.1	18.6	19.8	18.8	17.8	17.4	17.2	15.8	14.0	12.4	16.1
7, 2, 9	14.1	15.6	18.3	21.0	21.8	20.7	19.4	19.2	19.0	17.9	16.2	14.5	18.1
Guaymas:													
8 a. m.	16.1	16.9	18.7	20.6	23.0	26.0	28.0	28.4	28.0	24.7	19.3	16.7	22.2
8 p. m.	20.1	21.2	23.5	26.3	28.6	30.8	31.9	31.6	31.0	28.4	22.9	19.9	26.3
8, 8	18.1	19.0	21.1	23.4	25.8	28.4	30.0	30.0	29.5	26.6	21.1	18.3	24.3
7, 2, 9	19.8	19.3	21.6	24.0	26.8	29.6	31.0	31.0	30.2	27.8	22.4	18.7	25.2
Hermosillo:													
8 a. m.	12.5	13.4	15.4	17.6	20.8	24.6	27.4	26.9	26.0	20.5	15.0	12.2	19.4
8 p. m.	20.5	22.4	25.7	29.0	32.2	34.7	34.8	33.9	32.8	28.6	22.5	18.9	28.0
8, 8	16.5	17.9	20.6	23.3	26.5	29.6	31.1	30.4	29.4	24.6	18.8	15.6	23.7
7, 2, 9	17.6	17.3	20.0	22.9	26.1	30.2	31.2	30.7	29.9	25.8	20.7	16.6	24.1
Huejutla:													
8 a. m.	17.6	18.9	21.4	23.6	25.4	25.9	25.8	25.7	24.8	22.8	20.5	18.2	22.5
8 p. m.	20.0	21.1	24.4	27.0	28.3	28.8	28.0	27.7	27.1	25.0	22.2	20.7	25.0
8, 8	18.8	20.0	22.9	25.3	26.8	27.4	26.9	26.7	26.0	23.9	21.4	19.4	23.8
7, 2, 9	19.4	20.3	23.6	26.8	28.1	28.7	28.0	27.7	26.7	24.4	21.9	20.2	24.6

TABLE 2.—*Monthly and annual mean temperatures (°C.) reduced to the epoch 1901–1910*—Continued.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Isla Mujeres:													
8 a. m.	23.3	23.7	24.6	25.0	26.5	26.7	27.1	27.4	27.0	26.0	24.3	23.7	25.4
8 p. m.	24.1	24.6	25.6	26.2	27.2	27.3	27.5	27.7	27.4	26.3	25.3	24.6	26.1
8, 8.	23.7	24.2	25.1	25.6	26.8	27.0	27.3	27.6	27.2	26.2	24.8	24.2	25.8
7, 2, 9.	23.8	24.1	25.2	25.6	27.0	27.2	27.4	27.6	27.3	26.1	24.8	24.2	25.9
Izamal:													
8 a. m.	16.0	16.9	18.9	21.2	23.5	23.8	23.2	23.0	22.6	21.3	19.0	17.3	20.6
8 p. m.	22.7	24.3	26.9	28.5	28.8	26.4	25.9	25.8	25.6	24.8	23.6	22.8	25.5
8, 8.	19.4	20.6	22.9	24.8	26.2	25.1	24.6	24.4	24.1	23.0	21.3	20.0	23.0
7, 2, 9.	21.8	22.9	25.2	27.2	28.3	27.4	26.4	26.1	26.0	25.5	23.7	22.4	25.2
Jalapa:													
8 a. m.	11.6	12.7	14.8	17.0	18.4	17.8	17.4	17.3	16.9	15.7	14.3	12.3	15.5
8 p. m.	14.1	15.2	17.1	19.0	19.9	19.3	19.0	19.0	18.4	17.5	16.0	14.7	17.5
8, 8.	12.8	14.0	16.0	18.0	19.2	18.6	18.2	18.2	17.6	16.6	15.2	13.5	16.5
7, 2, 9.	13.8	14.8	17.0	19.4	20.2	19.2	18.8	18.8	18.3	17.3	15.9	14.5	17.3
La Barca:													
8 a. m.	8.8	10.1	12.7	15.1	17.1	18.5	17.5	16.8	16.0	14.4	12.6	9.7	14.1
8 p. m.	18.6	20.8	23.2	25.4	26.7	24.7	22.7	21.9	21.7	21.3	20.5	19.0	22.2
8, 8.	13.7	15.4	18.0	20.2	21.9	21.6	20.1	19.4	18.9	17.8	16.6	14.4	18.2
7, 2, 9.	15.3	16.8	19.7	22.4	24.0	23.4	21.5	21.0	20.8	19.8	18.1	15.9	19.9
Lagos:													
8 a. m.	7.4	8.0	9.9	12.2	14.2	15.9	14.9	14.4	14.1	13.3	11.3	8.2	12.0
8 p. m.	17.9	19.2	22.2	24.2	26.1	25.1	23.2	22.4	22.0	21.5	19.7	18.2	21.8
8, 8.	12.6	13.6	16.0	18.3	20.2	20.5	19.0	18.4	18.0	17.4	15.5	13.2	16.9
7, 2, 9.	13.8	15.1	17.9	20.1	21.6	22.1	21.0	20.6	20.2	19.1	16.5	14.3	18.5
Lampazos:													
8 a. m.	10.0	11.3	15.5	19.5	23.0	25.8	25.3	25.4	23.4	18.8	14.8	10.0	18.6
8 p. m.	15.8	17.4	22.1	25.8	29.8	32.8	32.5	33.5	30.4	25.4	20.1	16.2	25.2
8, 8.	12.9	14.4	18.8	22.6	26.9	29.3	28.9	29.4	26.9	22.1	17.4	13.1	21.9
7, 2, 9.	13.6	15.0	19.3	22.6	26.3	29.0	29.3	30.0	27.5	22.1	17.6	13.6	22.2
Leon:													
8 a. m.	6.9	8.5	11.0	13.8	16.1	17.2	16.2	15.6	14.7	12.4	9.7	7.7	12.5
8 p. m.	17.4	19.8	22.9	25.8	27.6	25.2	22.8	22.2	21.6	20.6	18.8	16.9	21.8
8, 8.	12.2	14.2	17.0	19.8	21.8	21.2	19.5	18.9	18.2	16.5	14.2	12.3	17.1
7, 2, 9.	13.6	15.5	18.7	21.5	22.9	22.4	20.7	20.4	19.7	18.3	16.2	14.0	18.7
Manzanillo:													
8 a. m.	21.4	21.2	21.6	22.8	24.7	26.4	26.4	25.6	25.6	25.2	23.9	22.3	23.9
8 p. m.	23.9	23.8	24.2	25.6	27.2	28.8	29.1	28.7	28.1	27.6	26.5	24.9	26.5
8, 8.	22.6	22.5	22.9	24.2	26.0	27.6	27.6	27.2	26.8	26.4	25.2	23.6	25.2
7, 2, 9.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mascota:													
8 a. m.	11.5	11.4	12.8	14.9	17.3	19.4	19.1	18.3	18.1	17.0	14.3	12.2	15.5
8 p. m.	19.4	19.8	20.9	22.5	24.0	25.0	23.8	22.2	21.5	21.0	20.0	19.2	21.6
8, 8.	15.4	15.6	16.8	18.7	20.6	22.2	21.2	20.2	19.8	19.0	17.2	15.7	18.5
7, 2, 9.	16.6	16.6	18.0	19.7	21.4	22.8	21.8	20.4	20.2	19.8	18.2	17.4	19.4
Maxcanu:													
8 a. m.	17.1	18.1	20.3	22.2	23.8	24.3	23.4	23.3	23.2	21.7	19.6	17.8	21.2
8 p. m.	23.5	25.2	27.5	29.2	29.7	27.9	27.3	27.4	27.0	26.0	24.8	23.5	26.6
8, 8.	20.3	21.6	23.9	25.7	26.8	26.1	25.4	25.4	25.1	23.8	22.2	20.6	23.9
7, 2, 9.	22.1	23.4	25.6	27.5	28.7	27.9	27.0	27.0	26.4	25.3	23.5	22.3	25.6
Mazatlan:													
8 a. m.	19.2	18.8	19.6	20.7	23.0	26.0	26.6	26.7	26.6	25.4	22.5	20.1	22.9
8 p. m.	22.1	21.6	22.7	23.9	25.6	28.1	29.0	29.3	29.3	28.5	25.4	22.8	25.7
8, 8.	20.6	20.2	21.2	22.3	24.3	27.0	27.8	28.0	28.0	27.0	24.0	21.4	24.3
7, 2, 9.	21.0	20.6	21.6	22.8	24.8	27.5	28.3	28.4	28.3	27.2	24.4	21.6	24.7
Merida:													
8 a. m.	18.2	19.2	21.1	23.1	25.0	25.2	24.7	24.6	24.4	23.1	21.0	19.4	22.4
8 p. m.	22.8	24.0	26.5	27.8	28.6	27.4	26.8	26.8	26.7	25.8	24.6	23.4	25.9
8, 8.	20.5	21.6	23.8	25.4	26.8	26.3	25.8	25.7	25.6	24.4	22.8	21.4	24.2
7, 2, 9.	22.3	23.1	25.1	27.1	28.4	27.7	27.0	27.0	26.9	26.0	24.3	22.9	25.6
Mexico:													
8 a. m.	6.3	8.1	9.7	12.1	13.7	13.9	13.4	13.3	12.9	11.3	9.5	7.4	11.0
8 p. m.	15.0	17.0	18.7	20.1	19.9	18.9	17.3	17.6	17.4	16.9	16.0	14.5	17.4
8, 8.	10.6	12.6	14.2	16.1	16.8	16.4	15.4	15.4	15.2	14.1	12.8	11.0	14.2
7, 2, 9.	11.9	13.8	16.0	17.9	18.5	18.2	17.2	17.1	16.6	15.1	14.1	12.4	15.7
Monterrey:													
8 a. m.	10.8	11.6	15.4	18.2	20.9	22.9	23.0	22.8	21.4	17.9	14.3	11.3	17.5
8 p. m.	17.0	18.9	22.8	25.6	30.8	31.0	30.5	30.9	27.6	23.1	19.1	17.3	24.5
8, 8.	13.9	15.2	19.1	21.9	25.8	27.0	26.8	26.8	24.5	20.5	16.7	14.3	21.0
7, 2, 9.	14.9	16.1	20.2	22.9	26.3	28.0	27.8	28.1	25.8	21.6	17.3	14.5	22.0
Morelia, Obs:													
8 a. m.	7.6	8.9	11.3	13.4	15.1	15.8	15.0	14.6	14.4	12.7	10.6	8.7	12.3
8 p. m.	16.3	18.9	20.9	22.6	22.5	20.8	19.3	18.7	18.5	17.9	17.0	16.1	19.1
8, 8.	12.4	13.9	16.1	18.0	18.8	18.3	17.2	16.6	16.4	15.3	13.8	12.4	15.8
7, 2, 9.	13.8	15.1	17.4	19.6	20.2	19.2	18.2	18.0	17.6	16.8	15.4	13.9	17.1
Morelia, Sem:													
8 a. m.	6.2	7.5	9.7	12.0	13.8	14.6	13.7	13.5	13.2	11.2	9.4	7.4	11.0
8 p. m.	16.9	18.7	20.4	21.6	21.7	20.5	19.2	18.4	18.2	18.0	17.5	16.9	19.0
8, 8.	11.6	13.1	15.0	16.8	17.8	17.6	16.4	16.0	15.7	14.6	13.4	12.2	15.0
7, 2, 9.	13.0	14.4	16.7	18.6	19.6	18.9	17.5	17.0	16.6	15.9	14.6	13.3	16.3
Oaxaca:													
8 a. m.	9.8	10.6	12.6	15.7	17.7	17.4	16.2	16.0	15.7	14.8	12.9	10.2	14.1
8 p. m.	19.2	21.4	23.3	24.4	23.0	21.6	21.4	21.3	20.7	20.2	19.8	19.4	21.3
8, 8.	14.5	16.0	18.0	20.0	20.4	19.5	18.8	18.6	18.2	17.5	16.4	14.8	17.7
7, 2, 9.	16.5	18.2	20.4	22.4	22.2	21.0	20.4	20.4	20.0	19.5	18.6	17.3	19.7
Ojinaga:													
8 a. m.	6.7	8.4	11.5	15.3	19.4	24.0	25.7	25.7	22.0	15.0	9.2	6.2	15.8
8 p. m.	16.4	18.7	24.0	27.5	31.0	34.2	33.2	32.5	29.1	24.6	19.3	14.4	25.4
8, 8.	11.6	13.6	17.8	21.4	25.2	29.1	29.4	29.1	25.6	19.8	14.2	10.3	20.6
7, 2, 9.	15.0	16.6	20.6	24.4	28.4	30.8	30.5	30.2	27.6	22.7	17.5	13.8	23.2
Pachuca:													
8 a. m.	7.1	8.0	9.6	11.5	13.2	13.1	12.5	12.3	11.8	10.9	9.3	7.6	10.6
8 p. m.	12.1	13.5	14.9	16.2	16.7	16.1	15.4	15.0	15.0	14.8	13.5	12.0	14.6
8, 8.	9.6	10.8	12.2	13.8	15.0	14.6	14.0	13.6	13.4	12.8	11.4	9.8	12.6
7, 2, 9.	12.4	14.1	16.0	17.3	17.3	16.4	15.6	15.2	15.2	14.9	13.5	12.5	15.0
Parral:													
8 a. m.	3.7	5.4	8.5	11.6	15.1	17.6	17.0	16.2	14.6	10.5	6.0	2.9	10.8
8 p. m.	14.7	16.1	19.0	22.6	28.0	26.2	24.1	23.1	21.4	19.2	16.0	14.6	20.4
8, 8.	9.2	10.8	13.8	17.1	21.6	21.9	20.6	19.6	18.0	14.8	11.0	8.8	15.6
7, 2, 9.	11.0	13.0	15.5	18.5	22.6	23.4	22.2	21.4	19.6	16.8	13.0	10.0	17.2

TABLE 2.—*Monthly and annual mean temperatures (°C.) reduced to the epoch 1901–1910*—Continued.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Peto:													
8 a. m.	15.8	17.0	18.9	21.0	23.1	23.9	22.9	23.1	22.5	20.9	18.9	17.0	20.4
8 p. m.	22.9	24.8	27.3	28.6	28.7	27.0	26.3	26.2	26.0	25.2	23.8	22.9	25.8
8, 8.	19.4	20.9	23.1	24.8	25.9	25.4	24.6	24.6	24.2	23.1	21.4	19.9	23.1
7, 2, 9.	21.9	23.1	25.3	27.3	28.2	27.6	26.5	26.1	25.7	24.7	23.2	22.1	25.1
Piedras Negras:													
8 a. m.	8.0	9.7	14.2	16.9	21.3	24.6	25.5	25.3	22.5	16.7	11.1	6.4	16.8
8 p. m.	15.7	18.2	23.4	26.1	29.8	33.7	32.4	33.8	30.4	24.8	18.0	14.2	25.0
8, 8.	11.8	14.0	18.8	21.5	25.6	29.2	29.0	29.6	26.4	20.8	14.6	10.3	21.0
7, 2, 9.	12.3	14.5	19.1	21.9	26.0	30.2	31.0	30.8	27.3	21.4	15.3	10.9	21.7
Pochutla:													
8 a. m.	19.1	20.0	21.1	22.7	24.3	23.8	22.4	22.7	27.0	22.6	20.6	19.4	21.8
8 p. m.	25.9	26.7	27.6	28.3	28.5	28.1	27.2	26.4	26.9	27.0	25.6	25.7	27.0
8, 8.	22.5	23.4	24.4	25.5	26.4	26.0	24.8	24.6	25.0	24.8	23.6	22.6	24.5
7, 2, 9.	24.3	25.2	26.6	27.9	27.8	27.0	26.6	26.7	26.4	26.0	25.3	24.5	26.2
Progreso:													
8 a. m.	19.5	19.9	21.3	23.0	24.8	25.6	25.3	25.2	25.4	24.8	22.6	20.5	23.2
8 p. m.	22.7	23.3	24.6	25.9	26.9	26.8	25.5	26.9	27.3	26.6	25.1	23.6	25.4
8, 8.	21.1	21.6	23.0	24.4	25.8	26.2	25.9	26.0	26.4	25.7	23.8	22.0	24.3
7, 2, 9.	22.2	22.6	24.0	25.4	26.6	27.0	26.8	26.5	26.9	26.3	24.4	22.9	25.1
Puebla:													
8 a. m.	6.1	6.4	8.5	12.0	13.5	13.6	13.3	13.0	12.2	11.1	8.9	6.3	10.4
8 p. m.	14.5	16.5	18.2	19.5	19.2	18.2	17.3	17.3	16.9	16.5	15.9	15.0	17.1
8, 8.	10.3	11.4	13.4	15.8	16.4	15.9	15.3	15.2	14.6	13.8	13.4	10.6	13.8
7, 2, 9.	12.3	13.3	15.5	17.5	18.0	17.0	16.6	16.7	16.2	15.6	14.2	12.5	15.4
Queretaro:													
8 a. m.	7.4	8.8	11.2	13.7	15.6	15.7	14.9	14.4	13.8	13.4	10.1	8.2	12.3
8 p. m.	17.0	18.6	22.0	23.7	24.0	22.8	21.3	20.8	20.1	19.2	18.1	16.8	20.4
8, 8.	12.2	13.7	16.6	18.7	19.8	19.2	18.1	17.6	17.0	15.8	14.1	12.5	16.3
7, 2, 9.	13.6	15.2	17.8	20.2	21.3	20.6	19.6	19.2	18.6	17.4	15.8	14.1	17.8
Rio Bravo:													
8 a. m.	12.9	14.6	17.5	20.4	23.6	26.7	25.4	25.4	23.4	19.9	15.4	12.2	19.8
8 p. m.	16.8	18.5	23.2	26.0	29.4	31.9	30.3	30.2	28.5	26.1	20.4	17.5	24.9
8, 8.	14.8	16.6	20.4	23.2	26.5	29.3	27.8	27.8	26.0	23.0	17.9	14.8	22.3
7, 2, 9.	15.4	16.9	20.8	23.6	26.9	29.7	28.7	29.2	27.1	24.1	18.9	15.6	23.1
Salina Cruz:													
8 a. m.	22.8	23.0	23.7	25.0	26.2	25.7	25.2	25.2	25.2	25.0	24.1	22.9	24.5
8 p. m.	25.1	25.9	27.6	28.9	29.2	28.7	28.8	29.0	28.7	27.8	26.8	25.7	27.7
8, 8.	24.0	24.4	25.6	27.0	27.7	27.2	27.1	27.2	27.0	26.4	25.4	24.3	26.1
7, 2, 9.	24.8	25.4	26.7	27.9	28.3	27.7	27.7	28.0	27.8	27.1	26.1	25.1	26.9
Saltillo:													
8 a. m.	8.4	9.8	12.3	15.4	17.9	19.4	18.4	18.0	15.8	13.5	10.8	7.9	14.0
8 p. m.	13.3	15.9	18.8	21.6	24.7	26.8	25.3	24.9	21.9	18.6	15.4	12.5	20.0
8, 8.	10.8	12.8	15.6	18.5	21.3	23.1	21.9	21.4	18.8	16.0	13.1	10.2	17.0
7, 2, 9.	11.7	14.0	16.9	19.5	22.5	23.7	22.1	22.2	19.9	16.7	13.6	11.1	17.8
San Cristobal:													
8 a. m.	6.4	6.6	8.5	10.4	11.9	13.1	12.3	12.0	12.7	12.5	10.6	8.2	10.4
8 p. m.	13.2	15.1	16.6	17.4	17.6	16.4	15.7	15.4	15.4	15.4	15.0	13.5	15.6
8, 8.	9.8	10.8	12.6	13.9	14.7	14.8	14.0	13.7	14.0	14.0	12.8	10.8	13.0
7, 2, 9.	11.3	12.4	13.8	14.2	16.4	15.8	15.0	14.8	15.0	14.9	14.0	12.1	14.1
San Juan Bautista:													
8 a. m.	21.5	22.4	24.6	26.5	28.2	27.3	27.0	27.1	26.4	25.2	24.0	22.4	25.2
8 p. m.	23.2	24.2	26.5	28.5	29.9	29.1	29.0	28.7	28.0	26.6	24.9	23.5	26.8
8, 8.	22.4	23.3	25.6	27.5	29.0	28.2	28.0	27.9	27.2	25.9	24.4	23.0	26.0
7, 2, 9.	22.6	23.4	25.6	27.6	29.0	28.4	28.5	28.2	27.5	26.0	24.4	23.1	26.2
San Luis Potosí:													
8 a. m.	7.6	9.5	12.2	15.0	17.0	17.0	16.8	16.3	15.4	13.0	11.1	9.1	13.3
8 p. m.	12.0	15.1	18.2	21.3	22.6	22.1	20.5	20.6	19.6	17.4	15.5	13.8	18.2
8, 8.	9.8	12.3	15.2	18.2	19.8	19.6	18.6	18.4	17.5	15.2	13.3	11.4	15.8
7, 2, 9.	11.4	13.3	16.1	19.0	20.7	21.0	19.2	19.3	18.6	16.4	14.7	13.0	16.9
Sierra Mojada:													
8 a. m.	9.8	10.6	14.1	16.5	19.5	20.4	21.5	21.0	18.9	15.3	12.2	9.7	15.8
8 p. m.	14.9	17.5	21.0	24.0	27.1	29.7	26.7	26.2	23.5	20.2	16.6	13.0	21.7
8, 8.	12.4	14.0	17.6	20.2	23.3	25.0	24.1	23.6	21.2	17.8	14.4	11.4	18.8
7, 2, 9.	13.2	14.9	18.2	21.0	24.3	25.6	24.8	24.2	21.8	18.4	14.6	12.0	19.4
Silacayoapan:													
8 a. m.	9.4	10.8	12.8	14.6	16.1	16.5	15.4	14.9	14.6	13.6	11.9	10.7	13.4
8 p. m.	18.9	20.4	21.9	22.9	22.3	21.3	20.3	20.2	20.3	20.5	19.6	18.0	20.6
8, 8.	14.2	15.6	17.4	18.8	19.2	18.9	17.8	17.6	17.4	17.0	15.8	14.4	17.0
7, 2, 9.	16.7	18.5	20.4	21.9	21.7	20.6	19.8	19.6	19.7	19.4	18.4	17.3	19.5
Tampico:													
8 a. m.	17.7	18.7	20.9	23.1	25.2	26.8	26.3	26.2	25.7	23.3	20.3	17.8	22.7
8 p. m.	19.8	20.2	22.5	24.8	26.7	27.7	27.8	28.0	27.4	25.3	22.5	19.3	24.3
8, 8.	18.8	19.4	21.7	24.0	26.0	27.2	27.0	27.1	26.6	24.3	21.4	18.6	23.5
7, 2, 9.	19.6	20.1	22.8	25.2	27.1	28.0	27.9	27.4	27.4	24.9	22.1	19.4	24.3
Tapachula:													
8 a. m.	19.9	20.9	22.1	23.5	24.6	23.7	22.5	22.0	22.1	22.7	22.5	20.9	22.3
8 p. m.	25.2	26.8	28.1	28.4	27.2	26.1	25.4	24.7	24.4	25.5	26.6	26.1	26.2
8, 8.	22.6	23.8	25.1	26.0	25.9	24.9	24.0	23.4	23.2	24.1	24.6	23.5	24.3
7, 2, 9.	24.8	25.9	27.0	27.3	26.8	25.8	25.1	25.0	24.9	25.1	25.9	25.4	25.8
Teocaltiche:													
8 a. m.	5.5	6.6	9.5	12.3	15.2	16.7	16.2	15.4	14.6	12.1	7.8	6.0	11.5
8 p. m.	18.2	19.7	23.1	25.4	27.1	26.3	23.3	22.4	22.0	21.4	20.0	18.8	22.3
8, 8.	11.8	13.2	16.3	18.8	21.2	21.5	19.7	18.9	18.3	16.8	13.9	12.4	16.9
7, 2, 9.	13.4	14.8	17.7	20.4	22.6	22.9	21.0	20.2	19.9	18.4	15.2	13.5	18.3
Tepic:													
8 a. m.	11.6	12.3	14.6	17.6	19.5	20.4	19.8	18.8	18.4	17.6	15.2	12.2	16.3
8 p. m.	17.3	18.7	21.0	23.0	24.6	25.3	24.2	22.7	22.4	22.2	20.9	18.2	21.7
8, 8.	14.4	15.5	17.8	20.3	22.0	22.8	22.0	20.8	20.4	19.9	18.0	15.2	19.1
7, 2, 9.	15.0	16.3	19.0	21.0	22.6	23.7	23.2	22.0	21.8	21.2	19.2	16.4	20.1
Tlaxcala:													
8 a. m.	6.0	7.1	8.9	11.9	13.6	13.6	13.2	12.5	11.8	11.2	9.2	7.1	10.5
8 p. m.	15.0	16.6	18.2	18.8	18.8	17.9	17.2	17.2	17.2	16.7	15.7	15.0	17.0
8, 8.	10.5	11.8	13.6	15.4	16.2	15.8	15.2	14.8	14.5	14.0	12.4	11.0	13.8
7, 2, 9.	12.4	13.9	16.1	17.8	18.3	17.4	16.7	16.6	16.6	16.1	14.6	13.0	15.8
Toluca:													
8 a. m.	2.5	3.4	6.2	9.1	10.7	11.1	10.8	10.3	10.0	8.3	5.5	3.7	7.6
8 p. m.	11.4	12.9	14.9	16.4	16.4	15.6	14.5	14.5	13.8	13.2	12.4	11.4	14.0
8, 8.	7.0	8.2	10.6	12.8	13.6	13.4	12.6	12.4	11.9	10.8	9.0	7.6	10.8
7, 2, 9.	8.9	10.3	12.4	14.5	15.6	15.2	14.1	14.0	13.5	12.5	10.9	9.4	12.6

Fig. 3. Month-to-month differences in mean temperature (°C.), January.

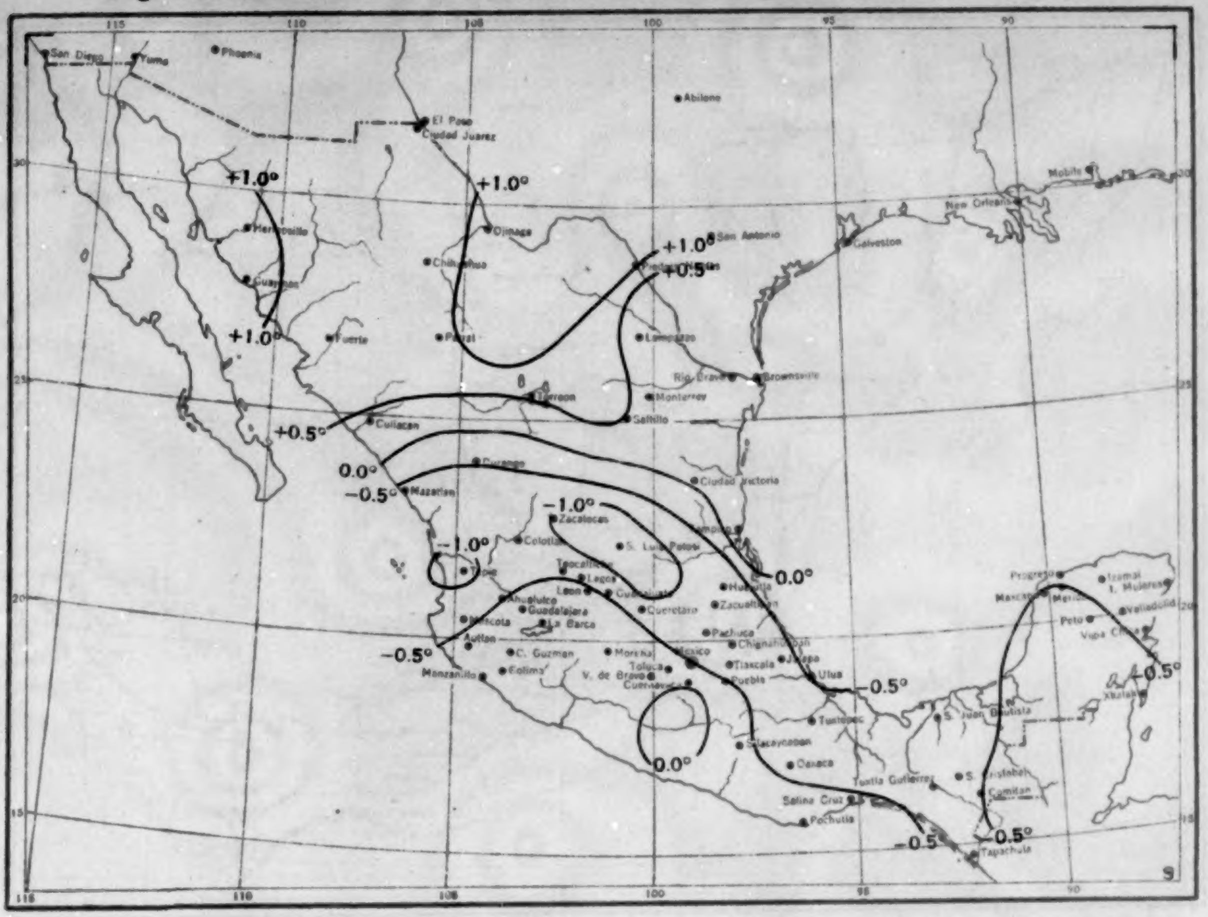


Fig. 4. Month-to-month differences in mean temperature (°C.), February.

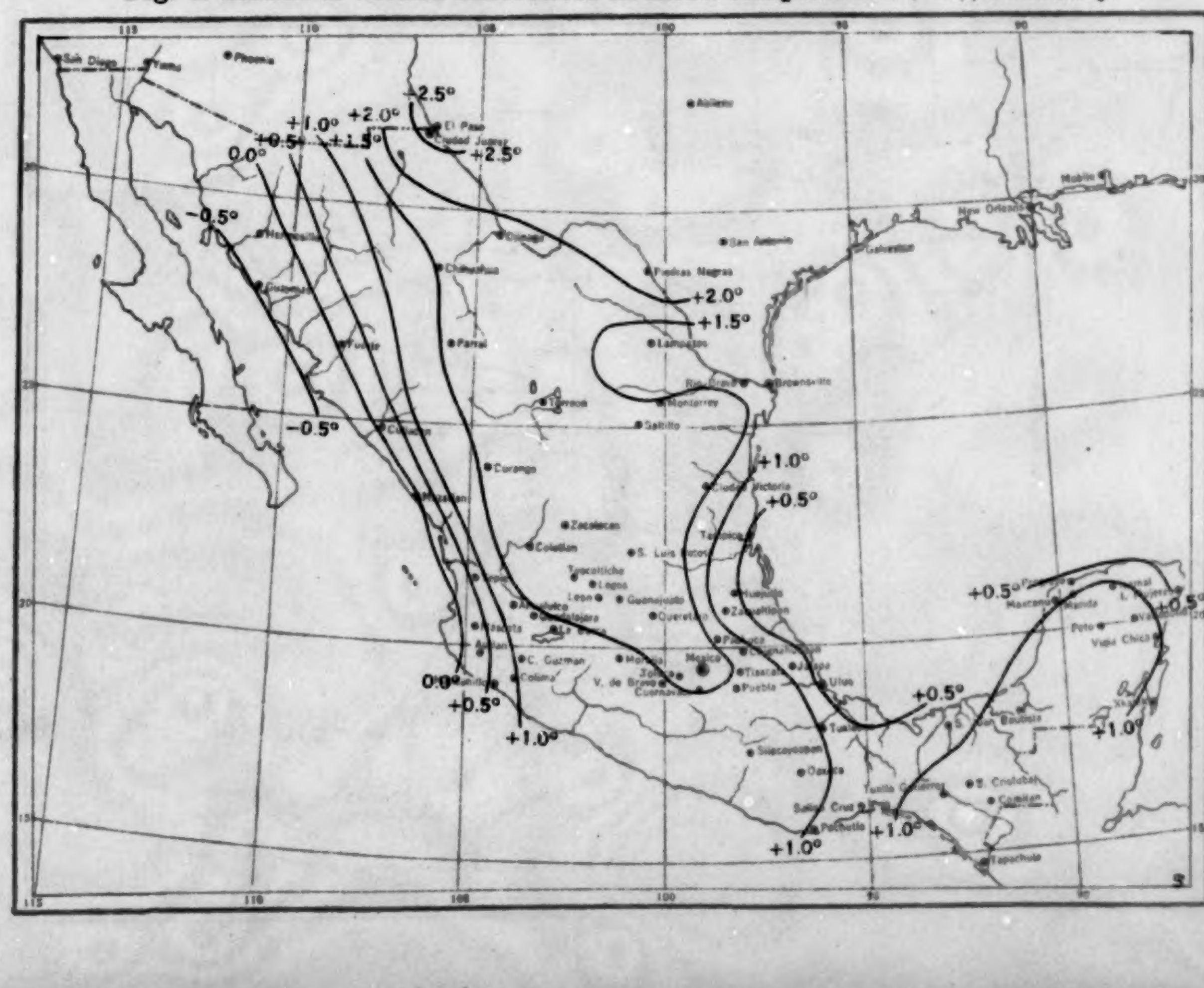


Fig. 5. Month-to-month differences in mean temperature (°C.), March.

Fig. 6. Month-to-month differences in mean temperature (°C.), April.

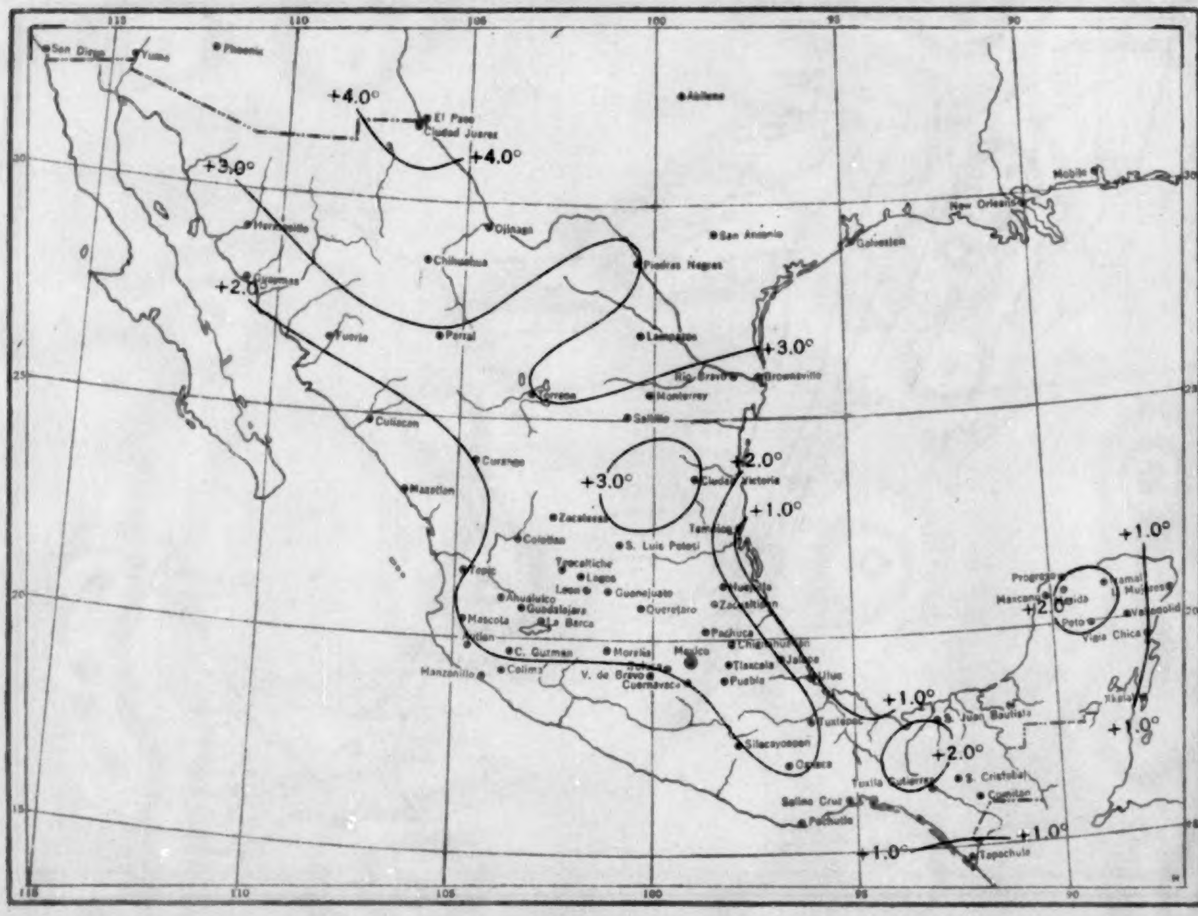


Fig. 7. Month-to-month differences in mean temperature (°C.), May.

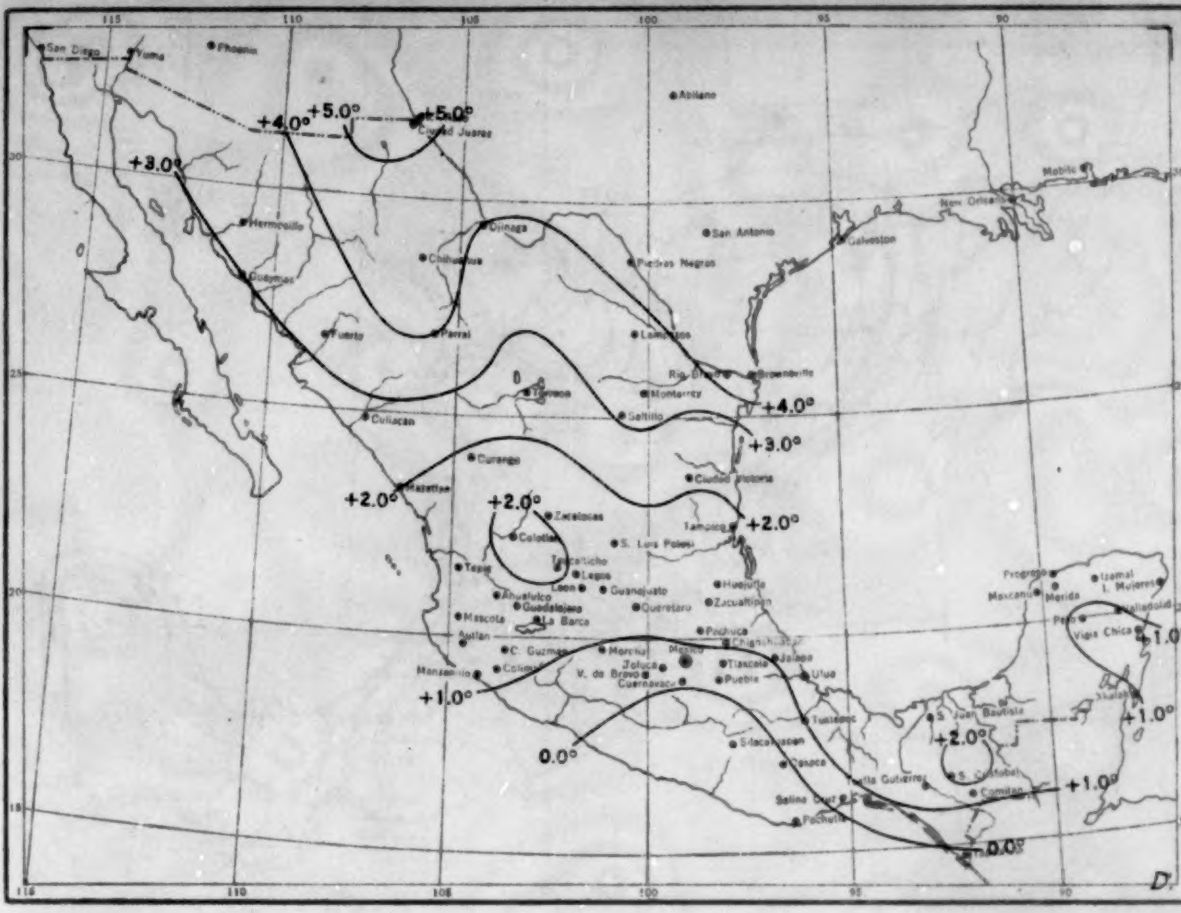


Fig. 8. Month-to-month differences in mean temperature (°C.), June.

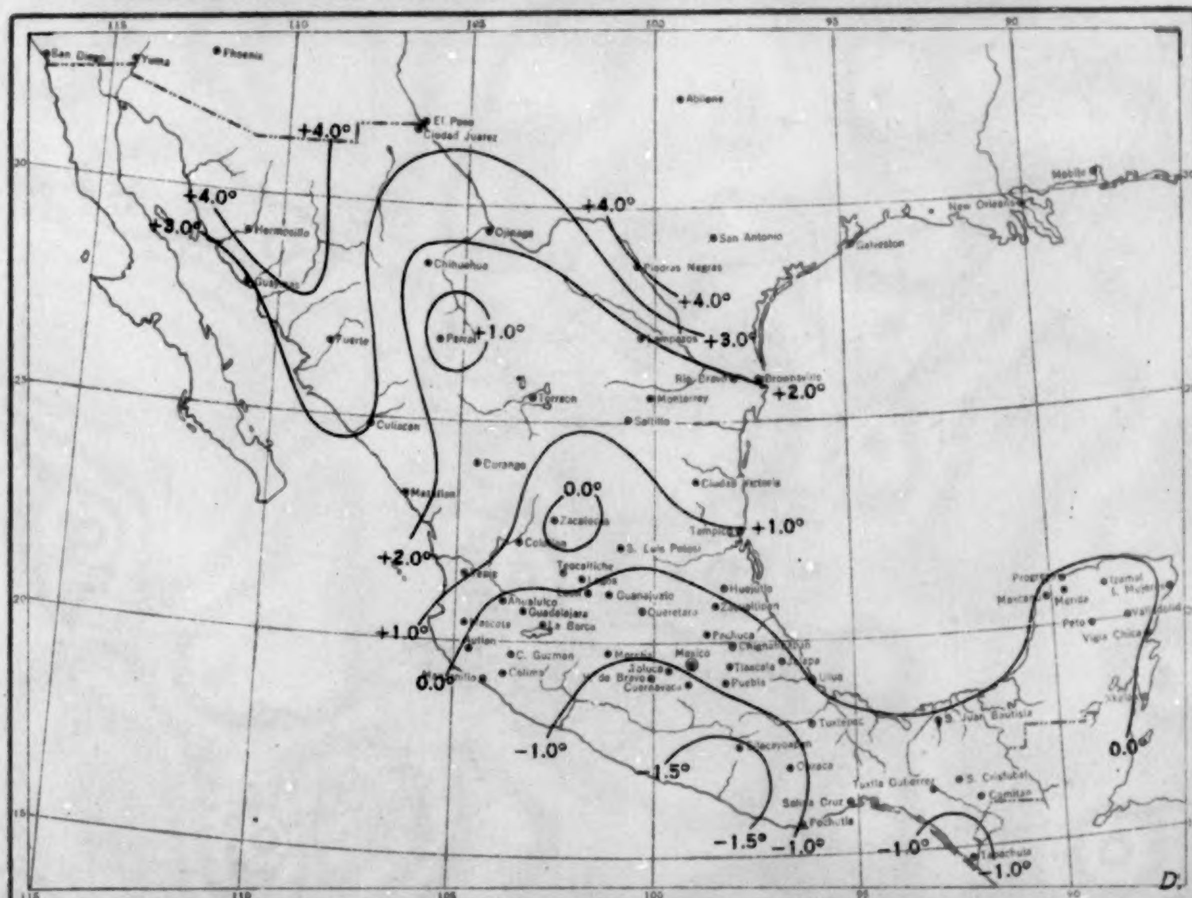


Fig. 9. Month-to-month differences in mean temperature (°C.), July.

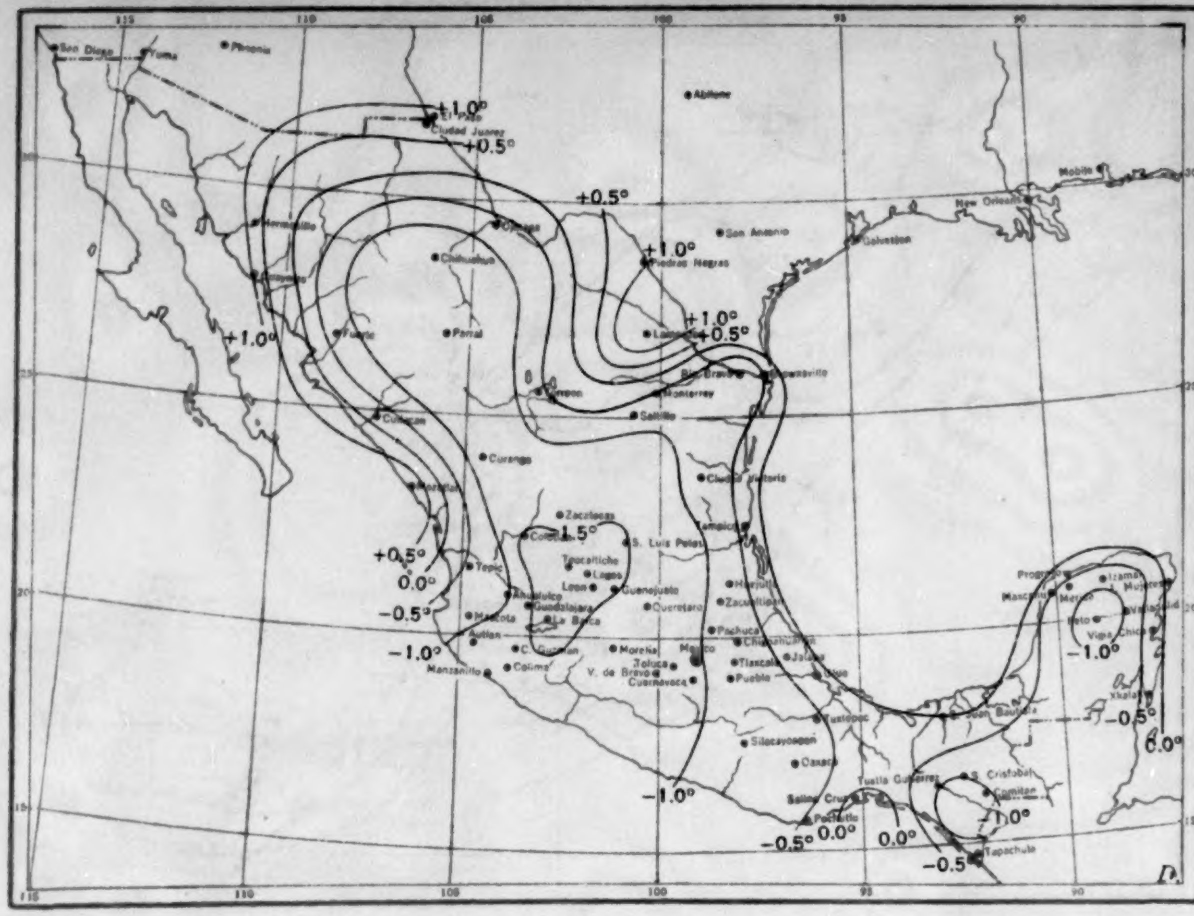


Fig. 10. Month-to-month differences in mean temperature (°C.), August.

Fig. 11. Month-to-month differences in mean temperature (°C.), September.

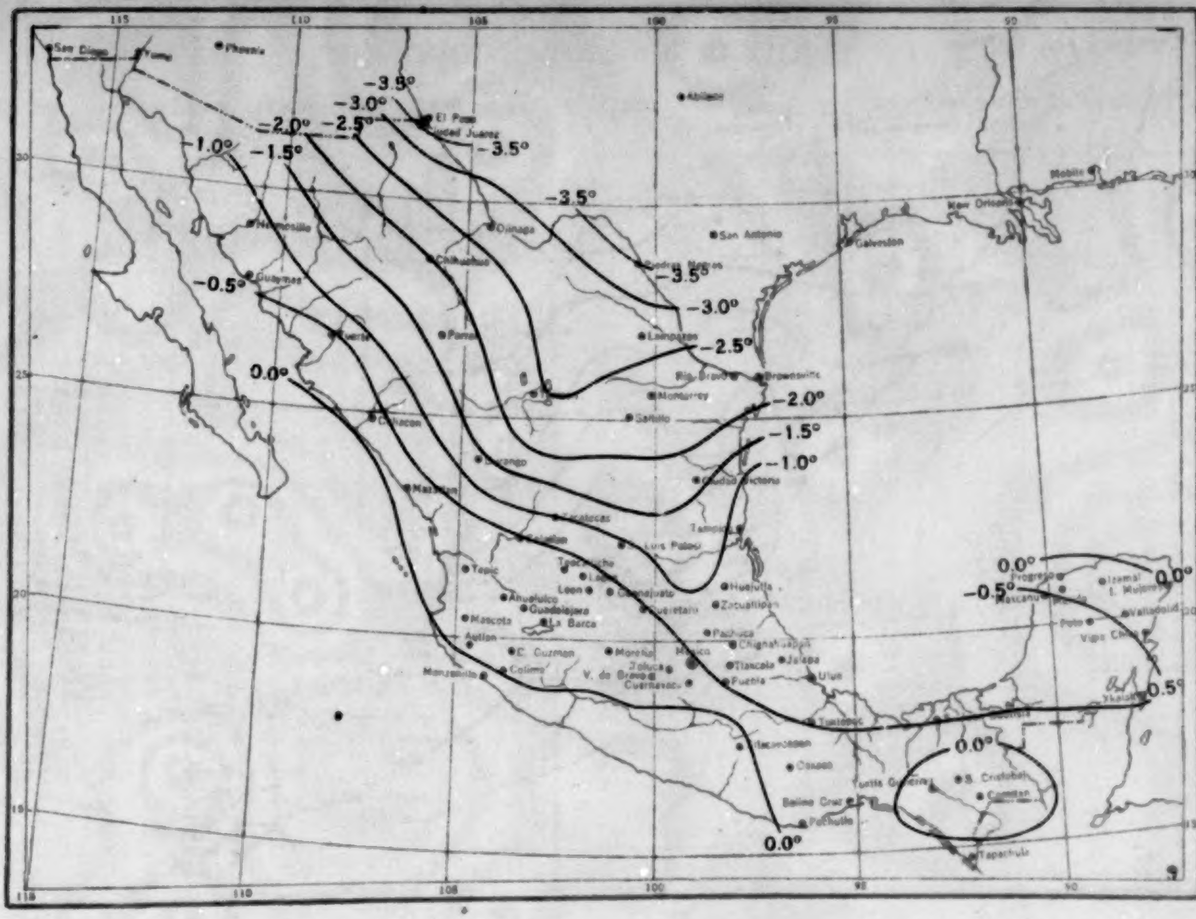


Fig. 12. Month-to-month differences in mean temperature (°C.), October.

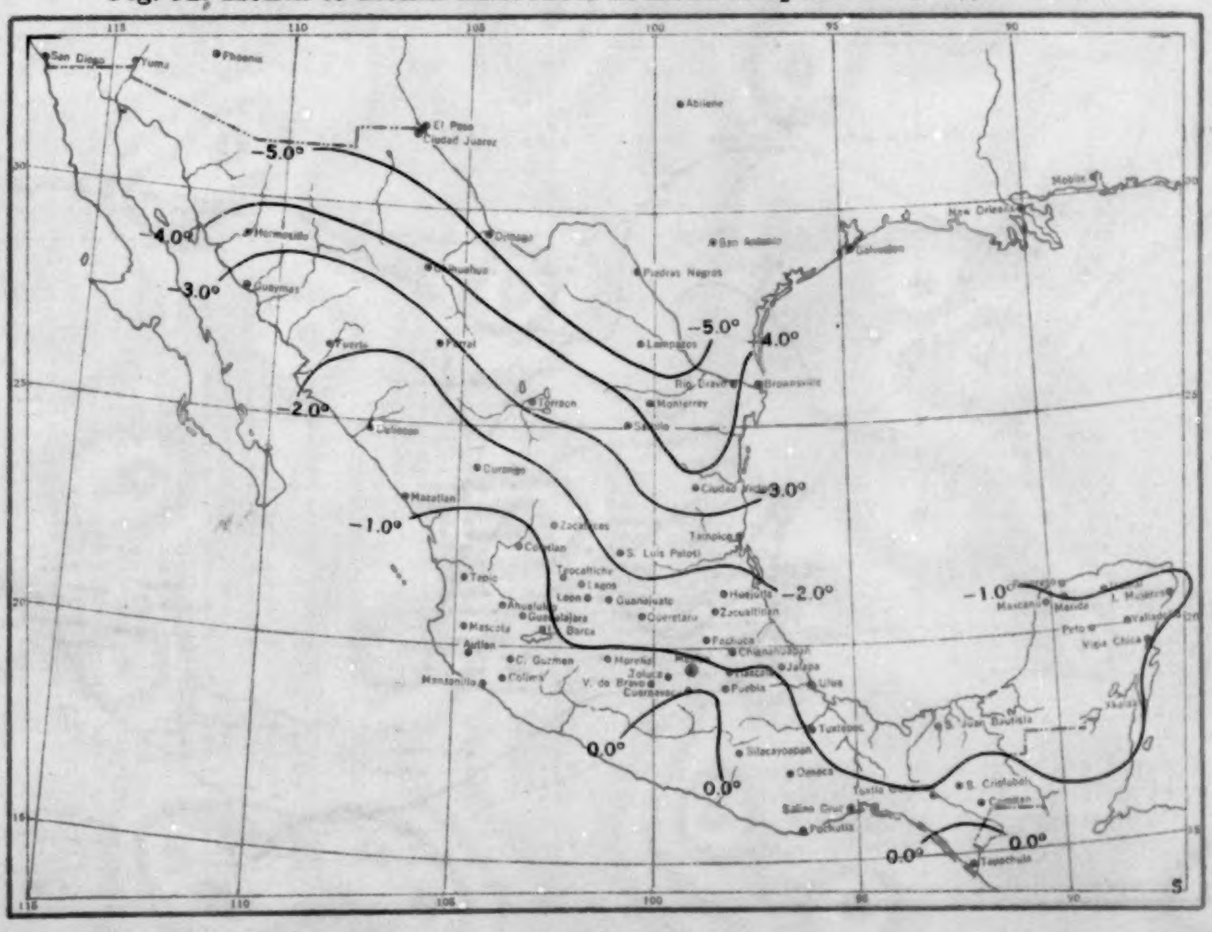


Fig. 13. Month-to-month differences in mean temperature (°C.), November.

Fig. 14. Month-to-month differences in mean temperature (°C.), December.

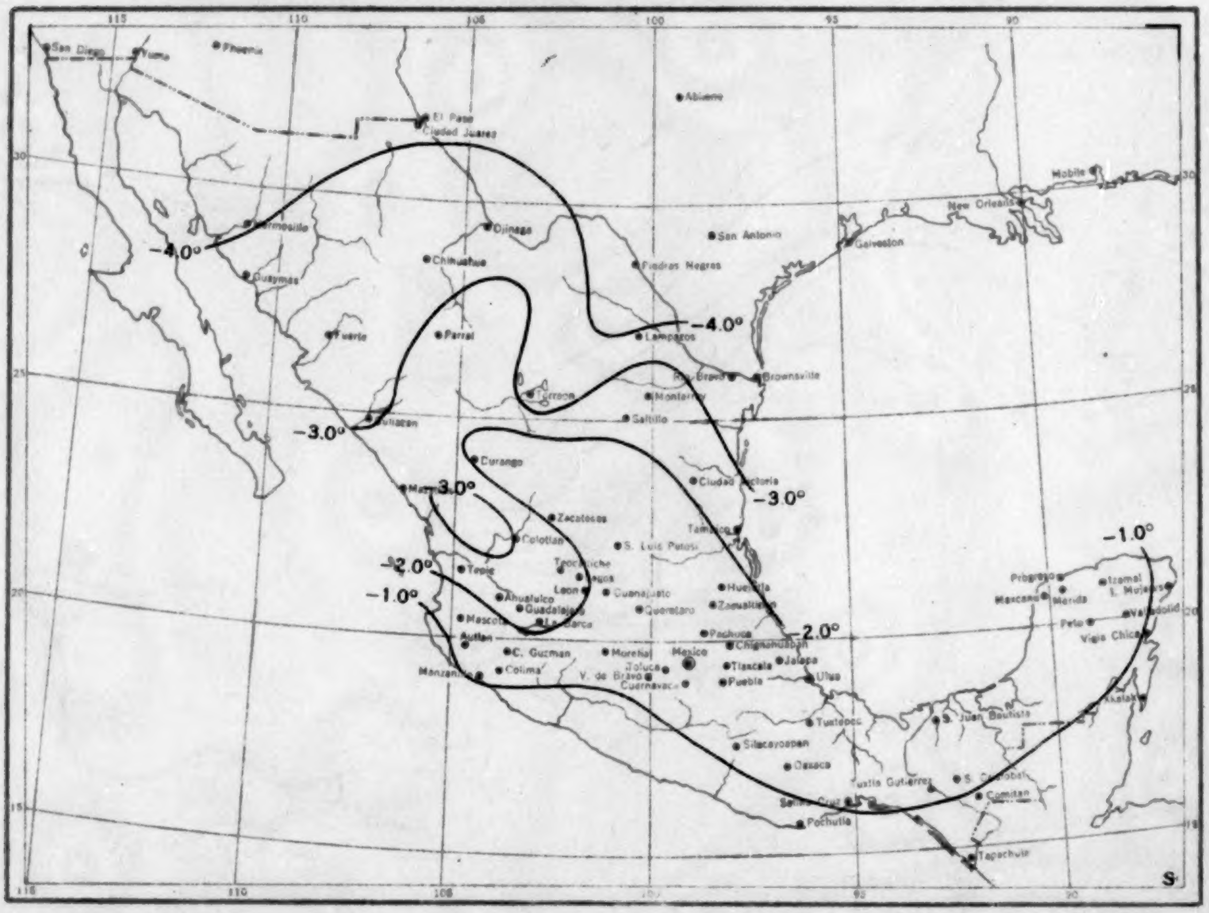


TABLE 2.—*Monthly and annual mean temperatures (°C.) reduced to the epoch 1901–1910*—Continued.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Torreon:													
8 a. m.	8.7	10.2	14.0	17.3	19.7	22.1	22.1	22.0	19.9	15.5	12.2	8.6	16.0
8 p. m.	18.7	20.7	24.9	27.7	29.6	30.9	30.0	30.0	27.3	24.1	20.9	17.7	25.3
8, 8	13.7	15.4	19.4	22.4	24.6	26.5	26.0	26.0	23.6	20.3	16.6	13.2	20.6
7, 2, 9	13.9	15.7	19.8	22.8	25.2	26.8	26.4	26.8	24.3	20.6	16.8	13.3	21.0
Tuxtepec:													
8 a. m.	18.0	18.9	20.5	23.1	24.8	24.9	23.7	23.8	23.8	23.1	21.4	19.5	22.1
8 p. m.	21.8	23.0	25.7	28.4	29.6	28.8	27.8	27.4	26.8	24.8	22.8	22.0	25.7
8, 8	19.9	21.0	23.1	25.8	27.2	26.8	25.8	25.6	25.3	24.0	22.1	20.8	24.0
7, 2, 9	21.1	22.0	24.3	26.8	28.3	27.5	26.4	26.3	26.2	25.0	23.3	21.7	24.9
Tuxtla Gutierrez:													
8 a. m.	17.5	18.2	19.6	22.3	23.5	23.4	22.4	22.1	22.2	21.6	20.1	18.5	21.0
8 p. m.	22.4	24.1	25.8	27.2	27.6	26.8	26.0	25.7	26.0	24.7	23.6	22.8	25.2
8, 8	20.0	21.2	22.7	24.8	25.6	25.1	24.2	23.9	24.1	23.2	21.8	20.6	23.1
7, 2, 9	21.3	22.6	24.0	25.9	27.2	26.5	25.4	25.1	25.5	24.2	23.0	21.9	24.4
Ulua:													
8 a. m.	19.4	19.9	21.6	23.6	25.4	25.6	25.3	24.8	24.4	23.5	21.9	20.0	23.0
8 p. m.	22.0	22.2	23.9	25.8	27.1	27.9	28.1	28.2	27.6	26.6	24.7	22.6	25.6
8, 8	20.7	21.0	22.8	24.7	26.2	26.8	26.7	26.5	26.0	25.0	23.2	21.3	24.2
7, 2, 9	21.2	21.6	23.4	25.3	26.5	27.0	26.9	27.0	26.5	25.4	23.6	21.6	24.7
Valladolid:													
8 a. m.	17.2	18.3	20.9	22.8	24.3	25.0	25.1	24.8	24.0	22.0	19.9	18.4	21.9
8 p. m.	22.0	23.3	25.5	26.8	27.0	26.2	25.9	25.8	25.5	24.7	23.3	22.2	24.7
8, 8	19.6	20.8	23.2	24.8	25.6	25.6	25.5	25.3	24.8	23.4	21.6	20.3	23.4
7, 2, 9	21.7	22.6	24.4	26.1	27.2	26.8	26.3	26.2	26.1	25.1	23.5	22.2	24.8
Valle de Bravo:													
8 a. m.	7.8	8.5	11.0	13.4	15.6	15.8	14.5	14.1	13.7	12.6	11.1	9.3	12.3
8 p. m.	16.1	17.3	20.0	22.2	22.7	20.7	19.2	18.3	18.0	17.8	17.5	16.5	18.9
8, 8	12.0	12.9	15.5	17.8	19.2	18.2	16.8	16.2	15.8	15.2	14.3	12.9	15.6
7, 2, 9	13.2	14.5	16.9	18.7	19.7	18.7	17.5	16.9	16.7	16.2	15.2	13.8	16.5
Vigia Chico:													
8 a. m.	21.0	22.2	23.7	24.7	25.2	25.4	25.6	26.0	25.6	24.1	22.7	21.3	24.0
8 p. m.	22.8	24.0	25.2	26.0	27.2	27.7	27.3	27.0	26.7	26.3	25.0	23.5	25.7
8, 8	21.9	23.1	24.4	25.4	26.2	26.6	26.4	26.5	26.2	25.2	23.8	22.4	24.8
7, 2, 9	22.2	23.5	24.6	25.6	26.5	27.2	27.3	27.4	27.2	25.8	24.2	22.7	25.4
Xkalak:													
8 a. m.	22.5	23.0	24.0	25.3	26.3	26.5	26.5	25.4	25.5	24.2	23.2	22.7	24.6
8 p. m.	23.4	24.0	25.2	26.2	27.0	27.4	27.4	27.2	26.5	25.4	20.4	23.7	25.3
8, 8	23.0	23.5	24.6	25.8	26.6	27.0	27.0	26.8	26.0	24.8	23.8	23.2	25.2
7, 2, 9	23.9	24.5	25.7	26.8	27.8	28.1	28.1	28.0	27.5	26.4	25.1	24.3	26.4
Zacatecas, Inst.:													
8 a. m.	5.7	6.7	8.9	11.3	13.3	13.2	12.1	12.3	11.4	9.5	7.7	6.2	9.9
8 p. m.	12.2	14.0	16.7	19.3	20.9	20.2	17.6	17.6	16.6	15.4	14.2	13.1	16.5
8, 8	9.0	10.4	12.8	15.3	17.1	16.7	14.8	15.0	14.0	12.4	11.0	9.6	13.2
7, 2, 9	...	...	...	...	...	...	...	...	...	...	...	...	...
Zacatecas, Bufa:													
8 a. m.	7.5	8.4	9.7	11.1	12.4	12.9	11.8	11.8	10.7	9.3	8.5	8.0	10.2
8 p. m.	12.2	13.3	16.2	18.5	19.6	18.9	17.3	17.2	16.2	15.0	13.9	12.9	15.9
8, 8	9.8	10.8	13.0	14.8	16.0	15.9	14.6	14.5	13.4	12.2	11.2	10.4	13.0
7, 2, 9	10.2	11.2	13.6	16.0	17.6	17.3	16.2	16.2	15.1	13.9	12.6	11.2	14.4
Zacualtipan:													
8 a. m.	7.0	7.6	8.9	11.5	13.6	13.4	12.9	12.6	12.0	10.5	8.9	7.6	10.5
8 p. m.	9.3	10.9	12.7	15.0	16.6	16.4	15.7	15.6	14.9	13.4	11.6	10.1	13.5
8, 8	8.7	9.2	10.8	13.2	15.1	14.9	14.3	14.1	13.4	12.0	10.2	8.8	12.1
7, 2, 9	8.9	10.2	12.4	14.7	16.1	15.7	15.2	15.0	14.5	12.8	10.9	9.4	13.0

TABLE 3.—*Temperature changes from month to month, 7, 2, 9 system (°C.).*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Ahualulco	−0.1	1.0	2.4	2.7	1.6	−0.8	−0.8	−0.4	−0.1	−0.9	−2.9	−1.7
Autlan	−0.3	0.7	1.9	2.3	1.3	0.1	−1.5	−1.4	−0.2	−0.5	−1.3	−1.1
C. Guzman	−0.1	1.3	2.3	2.0	0.8	−0.8	−1.1	−0.3	0.0	−0.4	−2.0	−1.7
C. Juarez	0.7	2.7	3.9	4.2	5.2	3.7	1.0	−1.5	−3.9	−5.9	−5.9	−4.2
C. Victoria	0.0	1.8	3.8	3.2	2.2	1.3	−0.8	1.1	−1.8	−4.0	−4.1	−2.7
Colima	−0.1	0.5	1.3	1.2	1.4	−0.2	−1.1	−0.2	−0.1	−0.3	−0.8	−1.6
Colotlan	0.4	2.3	3.0	2.2	2.0	1.2	−2.1	−0.8	−0.4	−1.3	−4.3	−3.2
Comitan	−0.2	1.1	1.5	1.3	1.0	−0.8	−1.2	0.0	0.4	−0.8	−1.4	−0.9
Cuernavaca	0.1	1.2	2.0	2.0	−0.5	−1.6	−1.0	−0.4	−0.1	0.1	−0.6	−1.2
Culiacan	0.5	0.0	1.8	2.1	2.4	2.7	−0.3	−0.8	−0.3	−1.7	−3.3	−3.1
Chignahuapan	−0.7	1.3	2.0	2.5	1.3	−0.5	−0.6	−0.1	−0.6	−1.6	−1.7	−1.3
Chihuahua	0.9	1.3	4.0	3.8	4.6	1.7	−1.4	−0.8	−2.0	−3.6	−5.3	−3.2
Durango	−0.5	1.7	3.2	2.0	1.8	1.4	−1.0	−1.1	−1.4	−1.7	−2.5	−1.9
Fuerte	0.7	0.0	3.0	2.4	3.4	3.2	−1.0	−1.3	−0.3	−2.6	−4.3	−3.2
Guadalajara	−0.4	1.6	2.3	2.6	1.4	−0.5	−1.3	−0.7	−0.3	−0.9	−1.8	−2.0
Guanajuato	−0.4	1.5	2.7	2.7	0.8	−1.1	−1.3	−0.2	−0.2	−1.1	−1.7	−1.7
Guaymas	1.1	−0.5	2.3	2.4	2.8	2.8	1.4	0.0	−0.8	−2.4	−5.4	−3.7
Hermosillo	1.0	−0.3	2.7	2.9	3.2	4.1	1.0	−0.5	−0.8	−4.1	−5.1	−4.1
Huejutla	−0.8	0.9	3.3	2.9	1.6	0.6	−0.7	−0.3	−1.0	−2.3	−2.5	−1.7
Isla Mujeres	−0.4	0.3	1.1	0.4	1.4	0.2	0.2	0.2	−0.3	−1.2	−1.3	−0.6
Izamal	−0.6	1.1	2.3	2.0	1.1	−0.9	−1.0	−0.3	−0.1	−0.5	−1.8	−1.3
Jalapa	−0.7	1.0	2.2	2.4	0.8	−1.0	−0.4	0.0	−0.5	−1.0	−1.4	−1.4
La Barca	−0.6	1.5	2.9	2.7	1.6	−0.6	−1.9	−0.5	−0.2	−1.0	−1.7	−2.2
Lagos	−0.5	1.3	2.8	2.2	1.5	0.5	−1.1	−0.4	−0.4	−1.1	−2.6	−2.2
Lampazos	0.0	1.4	4.3	3.3	3.7	2.7	0.3	0.7	−2.5	−5.4	−4.5	−4.0
Leon	−0.4	1.9	3.2	2.8	1.4	−0.5	−1.7	−0.3	−0.7	−1.4	−2.1	−2.2
Manzanillo	...	...	...	...	...	...	...	...	...	...	...	...
Mascota	−0.8	0.0	1.4	1.7	1.7	1.4	−1.0	−1.4	−0.2	−0.4	−1.0	−0.8
Maxcanu	−0.2	1.3	2.2	1.9	1.2	−0.8	−0.9	0.0	−0.6	−1.1	−1.8	−1.2
Mazatlan	−0.6	−0.4	1.0	1.2	2.0	2.7	0.8	0.1	−0.1	−1.1	−2.8	−2.8

TABLE 3.—*Temperature changes from month to month, 7, 2, 9 system (°C.)*—Continued.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Merida	−0.6	0.8	2.0	2.0	1.3	−0.7	−0.7	0.0	−0.1	−0.9	−1.7	−1.4
Mexico	−0.5	1.9	2.2	1.9	0.6	−0.3	−1.0	−0.1	−0.5	−1.5	−1.0	−1.7
Monterrey	−0.4	1.2	4.1	2.7	3.4	1.7	−0.2	0.3	−2.3	−4.2	−4.3	−2.8
Morelia, Obs.	−0.1	1.3	2.8	2.2	0.6	−1.0	−1.0	−0.2	−0.4	−0.8	−1.4	−1.5
Morelia, Sem.	−0.3	1.4	2.3	1.9	1.0	−0.7	−1.4	−0.5	−0.4	−0.7	−1.3	−1.3
Oaxaca	−0.8	1.7	2.2	2.0	−0.2	−1.2	−0.6	0.0	−0.4	−0.5	−0.9	−1.3
Ojinaga	1.2	1.6	4.0	3.8	4.0	2.4	−0.3	−0.3	−2.6	−4.9	−5.2	−3.7
Pachuca	−0.1	1.7	1.9	1.3	0.0	−0.9	−0.8	−0.4	0.0	−0.3	−1.4	−1.0
Parral	1.0	2.0	2.5	3.0	4.1	0.8	−1.2	−0.8	−1.8	−2.8	−3.8	−3.0
Peto	−0.2	1.2	2.2	2.0	0.9	−0.6	−1.1	−0.4	−0.4	−1.0	−1.5	−1.1
Piedras Negras	1.4	2.2	4.6	2.8	4.1	4.2	0.8	−0.2	−3.5	−5.9	−6.1	−4.4
Pochutla	−0.2	0.9	1.4	1.3	−0.1	−0.8	−0.4	0.1	−0.3	−0.4	−0.7	−0.8
Progreso	−0.7	0.4	1.4	1.4	1.2	0.4	−0.2	−0.3	0.4	−0.6	−1.9	−1.5
Puebla	−0.2	1.0	2.2	2.0	0.5	−1.0	−0.4	0.1	−0.5	−0.6	−1.4	−1.7
Queretaro	−0.5	1.6	2.6	2.4	1.1	−0.7	−1.0	−0.4	−0.6	−1.2	−1.6	−1.7
Rio Bravo	−0.2	1.5	3.9	2.8	3.3	2.8	−1.0	0.5	−2.1	−3.0	−5.2	−3.3
Salina Cruz	−0.3	0.6	1.3	1.2	0.4	−0.6	0.0	0.3	−0.2	−0.7	−1.0	−1.0
Saltillo	0.6	2.3	2.9	2.6	3.0	1.2	−1.6	0.1	−2.3	−3.2	−3.1	−2.5
San Cristobal	−0.8	1.1	1.4	0.4	2.2	−0.6	−0.8	−0.2	0.2	−0.1	−0.9	−1.9
S. Juan Bautista	−0.5	0.8	2.2	2.0	1.4	−0.6	0.1	−0.3	−0.7	−1.5	−1.6	−1.3
S. Luis Potosi	−1.6	1.9	2.8	2.9	1.7	0.3	−1.8	0.1	−0.7	−2.2	−1.7	−1.7
Sierra Mojada	1.2	1.7	3.3	2.8	3.3	1.3	−0.8	−0.6	−2.4	−3.4	−3.8	−2.6
Silacayoapan	−0.6	1.8	1.9	1.5	−0.2	−1.1	−0.8	−0.2	0.1	−0.3	−1.0	−1.1
Tapachula	−0.6	1.1	1.1	0.3	−0.5	−1.0	−0.7	−0.1	−0.1	0.2	0.8	−0.5
Tampico	0.2	0.5	2.7	2.4	1.9	0.9	−0.1	−0.5	0.0	−2.5	−2.8	−2.7
Teocaltiche	−0.1	1.4	2.9	2.7	2.2	0.3	−1.9	−0.8	−0.3	−1.5	−3.2	−1.7
Tepic	−1.4	1.3	2.7	2.0	1.6	1.1	−0.5	−1.2	−0.2	−0.6	−2.0	−2.8
Tlaxcala	−0.6	1.5	2.2	1.7	0.5	−0.9	−0.7	−0.1	0.0	−0.5	−1.5	−1.6
Toluca	−0.5	1.4	2.1	2.1	1.1	−0.4	−1.1	−0.1	−0.5	−1.0	−1.6	−1.5
Torreon	0.6	1.8	4.1	3.0	2.4	1.6	−0.4	0.4	−2.5	−3.7	−3.8	−3.5
Tuxtepec	−0.6	0.9	2.3	2.5	1.5	−0.8	−1.1	−0.1	−0.1	−1.2	−1.7	−1.6
Tuxtla Gutierrez	−0.6	1.3	1.4	1.9	1.3	−0.7	−1.1	−0.3	0.4	−1.3	−1.2	−1.1
Ulua	−0.4	0.4	1.8	0.9	1.2	0.5	−0.1	0.1	−0.5	−1.1	−0.8	−2.0
Valladolid	−0.5	0.9	1.8	1.7	1.1	−0.4	−0.5	−0.1	−0.1	−1.0	−1.6	−1.3
Valle de Bravo	−0.6	1.3	2.4	1.8	1.0	−1.0	−1.2	−0.6	−0.2	−0.5	−1.0	−1.4
Vigia Chico	−0.5	1.3	1.1	1.0	0.9	0.7	0.1	0.1	−0.2	−1.4	−1.6	−2.5
Xkalak	−0.4	0.6	1.2	1.1	1.0	0.3	0.0	−0.1	−0.5	−1.1	−1.3	−0.8
Zacatecas, Inst.	...	...	...	...	...	...	...	...	...	...	...	...
Zacatecas, Bufa	−1.0	1.0	2.4	2.4	1.6	−0.3	−1.1	0.0	−1.1	−1.2	−1.3	−1.4
Zacualtipan	−0.5	1.3	2.2	2.3	1.4	−0.4	−0.5	−0.2	−0.5	−1.7	−1.9	−1.5

TABLE 4.—*Months of maximum and minimum temperature (7, 2, 9 system), with amplitude in °C.*

Stations.	Max.	Min.	Amp.	Stations.	Max.	Min.	Amp.
			°				°
Ahualulco	May	Jan	7.7	Oaxaca	Apr	Jan	5.9
Autlan	June	do	6.3	Ojinaga	June	Dec	17.0
C. Guzman	May	do	6.4	Pachuca	May	Jan	4.9
C. Juarez	July	Dec	21.4	Parral	June	Dec	13.4
C. Victoria	Aug	Dec.[1]	12.6	Peto	May	Jan	6.3
Colima	May	Jan	4.4	Piedras Negras	July	Dec	20.1
Colotlan	June	Dec	11.1	Pochutla	Apr	Jan	3.6
Comitan	May	Jan	4.9	Progreso	June	do	4.8
Cuernavaca	Apr	Dec	5.3	Puebla	May	do	5.7
Culiacan	June	do	9.5	Queretaro	do	do	7.7
Chihuahua	do	do	16.3	Rio Bravo	June	do	14.3
Chignahuapan	May	Jan	7.1	Salina Cruz	May	do	3.5
Durango	June	do	10.1	Saltillo	June	Dec	12.6
Fuerte	do	Dec	12.7	S. Cristobal	May	Jan	5.1
Guadalajara	May	Jan	7.9	S. Juan Bautista	do	do	6.4
Guanajuato	do	do	7.7	S. Luis Potosi	June	do	9.6
Guaymas	July[2]	Dec	12.3	Sierra Mojada	do	Dec	13.6
Hermosillo	July	do	14.6	Silacayoapan	Apr	Jan	5.2
Huejutla	June	Jan	9.3	Tapachula	do	do	2.5
Isla Mujeres	Aug	do	3.8	Tampico	June	Dec	8.6
Izamal	May	do	6.5	Teocaltiche	do	Jan	9.5
Jalapa	do	do	6.4	Tepic	do	do	8.7
La Barca	do	do	8.7	Tlaxcala	May	do	5.9
Lagos	June	do	8.3	Toluca	do	do	6.7
Lampazos	Aug	Dec.[1]	16.4	Torreon	June	Dec	13.5
Leon	May	Dec	9.3	Tuxtepec	May	Jan	7.2
Manzanillo	...	...	...	Tuxtla Gutierrez	do	do	5.9
Mascota	June	Jan.[3]	6.2	Ulua	June	do	5.8
Maxcanu	May	Jan	6.6	Valladolid	May	do	5.5
Mazatlan	Aug	Feb	7.8	Valle de Bravo	do	do	6.5
Merida	May	Jan	6.1	Vigia Chico	Aug	do	5.2
Mexico	do	do	6.6	Xkalak	July	do	4.2
Monterrey	Aug	Dec	13.6	Zacatecas, Inst.	...	...	...
Morelia, Obs	May	Jan	6.4	Zacatecas, Bufa	May	Jan	7.4
Morelia, Sem	do	do	6.6	Zacualtipan	do	do	7.2

[1] January also. [2] August also. [3] February also.

With the march of the sun toward the Tropic of Cancer there must occur the first maximum of temperature for points having the subtropical thermal type of variation, which coincides with the passage of the sun through

the zenith of the given place. A region of the country embracing part of the States of Morelos, Guerrero, Oaxaca, and Chiapas has rapid rise in temperature to April, with immediate fall in the following month. As the second maximum shows but feeble intensity the monthly value for April is the highest for the year in that region as can be seen in Figure 16.

The region immediately north of this records its monthly maximum in May. The configuration of the curves that limit the different regions—curves penetrating rather far into the interior of the territory while in the vicinity of the seas they run parallel to the coasts—shows that the annual maximum is advanced at Continental stations relative to maritime stations. The explanation is well known, but it may not be superfluous to state that it is due to the presence of large quantities of water vapor in the maritime region that give normal march in temperature.

From Zacatecas and S. Luis Potosi to the northern frontier June is the month with maximum temperature; the advance during this month is more pronounced than that just mentioned. The limiting curve runs, at times, in a north-south direction along the Gulf of California and between the regions of the Conchos and Panuco Rivers.

North of the Tropic of Cancer there are found, symmetrically located in the eastern and western parts of the country, two regions in which the maximum does not occur until August, when the sun has not only retreated but has a declination much less than in the extreme southern stations of the country. In these two regions, more evidently in the eastern one and with a relation to distance from the sea, the stations have a first maximum in June. The temperature change from June to July becomes negative because of weather types with long periods of rainfall that occur during the month of July and necessarily lower the temperature. In August weather conditions are less favorable since, although the rains are generally heavier than in the preceding month, the periods of rainfall are less prolonged, permitting the temperature to rise to a higher point than was recorded for the month of June. In referring to this phenomenon it is found convenient to use the term "summer temperature anomaly" (*perturbacion de verano*), and since it plays such a remarkable role in the climate of Mexico, there will be frequent reference to it later.

Lastly, north of the regions in which the maximum monthly temperature is recorded in June or August there is situated a region in which that phenomenon occurs in July. As in all the territory of the United States (exceptions being made) the annual maximum of temperature is observed in this month (July) and in our country the same statement can be made relative to the region situated immediately north of the tropic, it is demonstrated that while in the temperate zone the march of temperature shows almost complete uniformity, in the intertropical zone the march is entirely different in this respect. In Mexico between latitudes 16° and 23° N. the maximum is recorded in one of the six months from April to September. With the country thus situated between the temperate zone and the limit of the thermal regimen of the region having two maxima and two minima, conditions could not be more unfavorable for arriving at definite conclusions relative to temperature. This is proven, contrary to the general belief that the variations in the meteorological elements in the intertropical zone is a perfect monotony. On the contrary, they are more subject to all kinds of influences that complicate in a remarkable manner the determination of the laws that obtain.

This fact is further confirmed, in relation to phenomena connected with temperature variations in the Republic, by the occurrence of the maximum monthly temperature in different successive months in the peninsula of Yucatan notwithstanding the small extent of the region and the absence of the influence of elevation. In this case the maximum mentioned advances from west to east, that is, from the Gulf of Mexico to the Caribbean Sea, in the following manner:

	Maximum in—
Maxcanu, Merida, Izamal, Peto, Valladolid	May.
Progreso, Xkalak	June.
Vigia Chico	July.
Isla Mujeres	August.

After the month of August the temperatures, except at stations with equatorial themal regimen, fall continually until December or January. The annual minimum occurs in these months. The country is divided into two great regions corresponding to the month in which this minimum is observed. The change takes place at a mean latitude of 24° N. There is, however, on the coasts of Sinaloa and Jalisco a region where the minimum tends to occur in February, and this fact is noted in marked manner at Mazatlan and Mascota. At the stations Sonora and Sinaloa, situated west of the heights of the Sierra Madre Occidental, after the minimum is registered in December there is also observed a fall from January to February. This is due to wind conditions at this time of the year and to the topographical situation.

The phenomenon that has been given the name "summer temperature anomaly" is probably due to unstable equilibrium in thermal conditions in the atmospheric strata in those regions where the curves of temperature show transition from the region with one maximum and one minimum to that with two maxima and two minima annually. In the present state of knowledge it is impossible to give a definite explanation; exploration of the upper atmospheric strata by means of specially adapted apparatus is to be recommended.

From the annual march of temperature in the different regions of the country it is found that this "summer temperature anomaly" is manifested in two different ways: First, by the presence of rainy weather at the middle of the season and a trend to a second maximum in the month of August; second, by no recurrence of rainy weather and by a tendency to a second maximum until September or October. The distribution of these different manifestations of the anomaly is related to two regions of the country, one situated to the north and the other to the south of the normal thermal equator of the summer.

The state of the weather at this time of the year is seen to be dominated very differently. In June, as in the remainder of the season, an area of low atmospheric pressure has its center in the region around Phoenix, Ariz., while the center of high pressure is located northeast of the Gulf of Mexico, connected, now directly, now indirectly, with the principal center of the Azores. The isobars of 758, 759, and 760 mm. have at that time a north-south orientation from the center of the United States to the Pacific coasts of Mexico in the States of Guerrero, Oaxaca, and Chiapas, while the western region of the country lies within the area of the depression in the northwest, with pressure values below 757.5 mm. The type of weather corresponding to this barometric situation is rain. In the following month the centers of

Fig. 15. Range in monthly means.

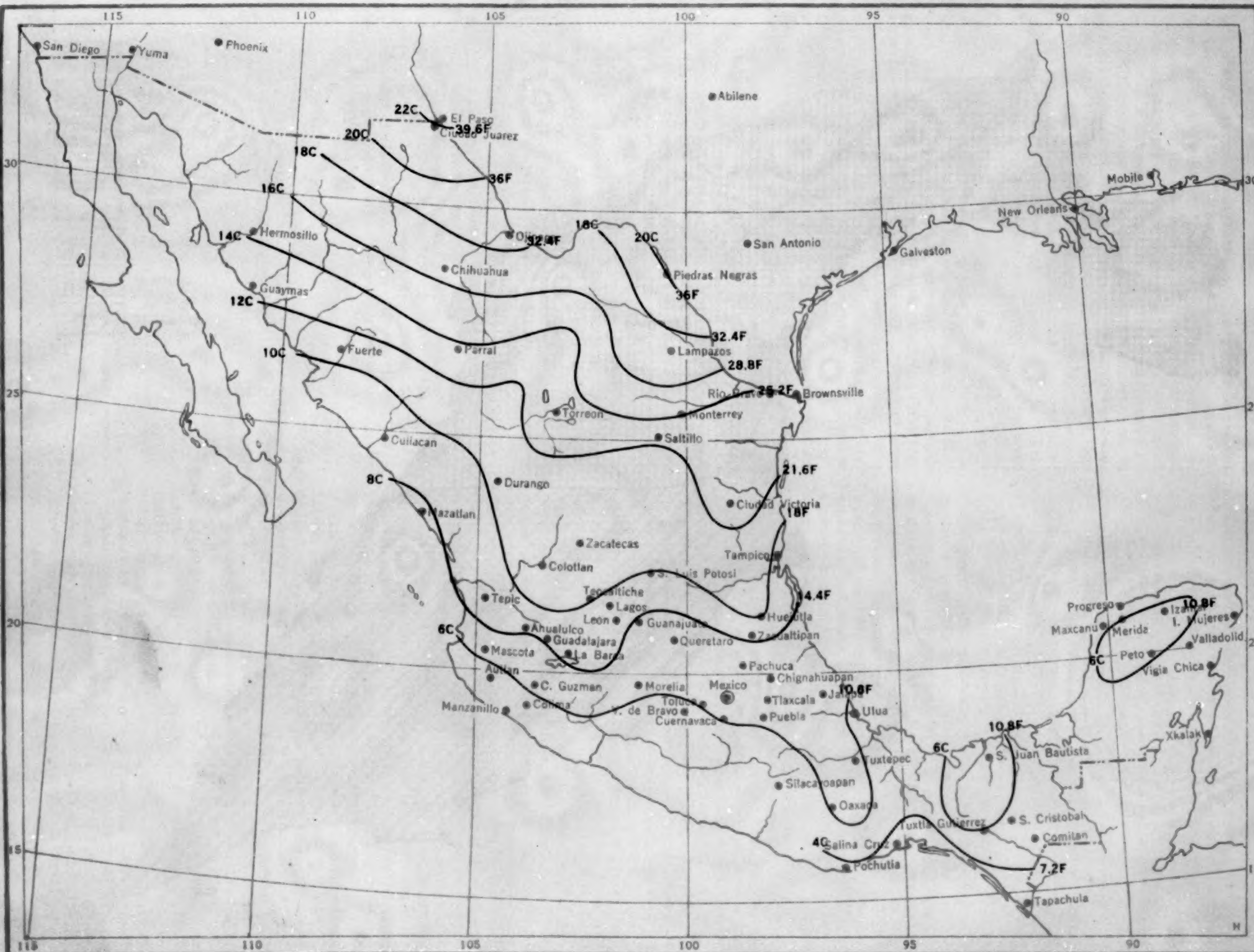
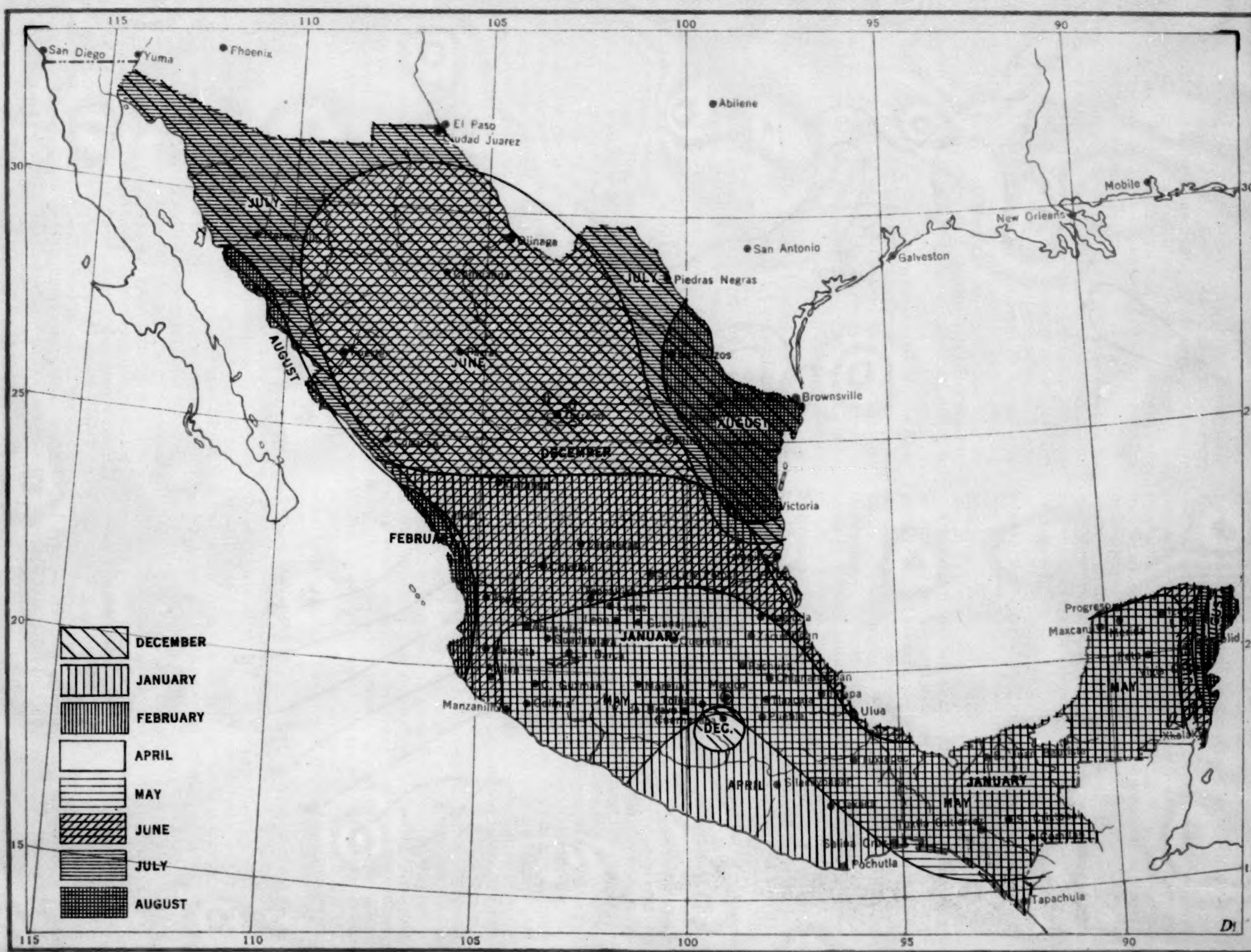


Fig. 16. Months of maximum and minimum temperature.



pressure, high and low, remain stationary, but important changes have taken place. Pressures over the Gulf slope have increased considerably and in addition the disposition of the isobars has changed somewhat. Through the first of these causes the curves have been shifted to the west, the isobar of 759 mm. remaining with the same north-south orientation somewhat as in the preceding month, the isobars of 760 and 761 mm., however, moving considerable distances toward the interior of the continent, causing relatively high pressure in the region of the Gulf of Mexico and the peninsula of Yucatan with values exceeding 762.5 mm. This barometric situation influences in marked manner the state of the weather in the region located just to the north of the thermal equator of summer and to even greater degree that on the western coasts of the Gulf in the States of Tamaulipas, Vera Cruz, and Tabasco. At that time the rains and the clouds appear for longer periods than during the remainder of the summer; the relatively steep barometric gradient that becomes established gives rather strong winds from the first quadrant. All these phenomena have greater or less influence on temperature, causing it to fall more or less according to the peculiar conditions found in the different regions.

In August, although the pressure values are higher, the barometric situation is of a type similar to that noted for June. The high pressure over the Gulf, observed in July, disappears, uniformity in barometric readings in this region being reestablished. With the return of normal barometric gradient the causes that forced the fall of temperature in the preceding month cease to be effective. On account of causes that are certainly related to the barometric situation, there are observed at that time different effects—a marked rise in temperature relative to that of July in the region where conditions were influenced by the "summer temperature anomaly"—and, although the rains are heavier, the hours with rain are limited to a certain period of the day, the previous conditions relative to humidity and cloudiness no longer existing. With diminution of the barometric gradient there is diminished wind force. Well known to the agriculturists of the region, under the influence of this phenomenon, is the occurrence, about this time of the year, of a period of dry weather, commonly called the "summer of August" (*verano de agosto*).

What has been stated relative to the barometric march in the eastern part of the country in the months of summer will be set forth more clearly by numerical values. The changes from month to month are as follows, show- the increase in pressure in July and the decrease in the month following:

	Difference June-July.	Difference July-August.
	Millimeters.	*Millimeters.*
Isla Mujeres	+0.48	−0.81
Progreso	+2.37	−1.16
Salina Cruz	+1.40	−1.75
Tapachula	+0.77	−0.62
Ulua	+3.28	−1.09
Matamoras	+1.43	−0.63

Now, let us take the stations of Progreso and San Luis Potosi, with a difference in longitude of nearly 11°. The summer gradients deduced from barometric heights are as follows:

	Progreso.	San Luis.	Difference.	Gradient.
	Millimeters.	*Millimeters.*	*Millimeters.*	*Millimeters.*
June	760.60	757.80	2.80	0.25
July	762.97	759.00	3.97	0.36
August	761.81	758.95	2.86	0.26
September	760.75	758.75	1.25	0.11

Lastly, we take the barometric readings in July at the stations situated around the Gulf of Mexico. The figures indicate the relative barometric height, as follows:

	Millimeters.
Brownsville	759.95
Galveston	761.35
New Orleans	761.99
Mobile	762.24
Key West	762.64
Habana	761.87
Progreso	762.97
Ulua	761.91
Salina Cruz	760.28
Tapachula	760.63
Xkalak	761.71
Isla Mujeres	761.71
Kingston	760.63

In general, the influence upon temperatures in the region contiguous to the Gulf that is exerted by the "summer temperature anomaly" is manifested by a fall in July and a rise in August. In the remaining part of the country, especially in the west, the effects of the barometric situation are not appreciable. After the first maximum the curves showing annual variation of temperature, reflecting the effect of the proximity of the thermal equator, present the inception of a second maximum about September and October, but without noticeable changes in the other atmospheric elements.

There are observed in addition, as special cases, the thermal type of Ciudad Juarez, clearly belonging to the temperate zone, where the "summer temperature anomaly" is without influence, and also transitional stages, found in the stations of the northern part of the country, the curves of annual variation for certain hours of the day influenced by this phenomenon. This last form of transition is seen clearly in the observations for 8 a. m., and it probably exists for the minimum and for all hours during the period of small hourly temperature change, which generally includes the last hours of the night and those of the early morning.

From the values of month to month variation in temperature charts have been constructed (figs. 3–14). In general these variations will necessarily be more marked the greater the annual amplitude of the monthly values. This amplitude, as is seen in Figure 15, increases with latitude in a very rapid manner, the extreme values being recorded at Tapachula (2.8° C., 5.0° F.) and at Ciudad Juarez (21.4° C., 38.5° F.).

Elevation, distance from the sea, and condition relative to vegetation are the factors that have greatest influence on climates, making them more or less extreme in direct relation to radiation. Naturally this is reflected in the annual amplitude in temperature.

The water vapor in the atmosphere is an important factor. Having the property of facilitating the storing of heat, it not only makes the climates less extreme but it retards the annual maximum, no fall in temperature taking place until the heat lost is greater than that supplied. This phenomenon observed on a large scale in the annual temperature march is also seen under identical conditions in the diurnal variation, hence the maximum of the day does not occur at noon, but during the first hours of the afternoon at a time determined by local conditions.

On Figure 15 there can be seen, after allowing for the influence of latitude, the effect that the arid plain of Coahuila produces in the curves of 12°, 14°, and 16° C. of amplitude in monthly values. The Sierra Madre Occidental produces the same effect in Jalisco in the curves of 10° and 8°C., and likewise the Sierra Oriental, in a very marked manner in the region with amplitude

ranging from 12° to 6° C., from Tamaulipas to Oaxaca. The *Mesa Central* manifests its influence in the curve indicating an amplitude of 10° C., forcing it to follow the Pacific coast between latitudes 26° and 20° N. In the interior of the plain of Yucatan on account of distance from the sea and scantness of vegetation, and in Chiapas on account of the presence of areas of considerable elevation there is to be observed an increase in amplitude.

From a study of the temperature changes from month to month it is seen that after the occurence of the minimum in December or January there is in the main uninterrupted rise in temperature in the months of spring. In fact, with the march of the sun toward the Tropic of Cancer the heat becomes greater and greater. The passage of the sun through the zenith at the different latitudes brings in turn to each the annual maximum at some time during the months from May to August in regions to which reference has been made. A fall in temperature is observed in the regions immediately south of those in which the maximum is occurring, this phenomenon invading the country from south to north. The presence of the "summer temperature anomaly" produces a change in temperature march in August in certain regions of the country, and in some of these regions in such a pronounced manner that the maximum is recorded at this time of the year, as occurs in Tamaulipas, Neuvo Leon, and Quintana Roo. In Sinaloa and Sonora that anomaly has no influence, but on account of other causes the maximum for these States is recorded in the same month (August).

The types of thermal regimen with double oscillation annually, whose maxima correspond to spring and autumn, respectively, are found in the States of the southern and southwestern regions, so also the corresponding types of transition.

With few exceptions all regions of the country have a general temperature fall after the month of September; this continues until the annual minimum is reached in December or January.

Although it may be considered merely fortuitous, the results obtained from the calculation of temperature variations from month to month and in the construction of charts have exceeded all expectation, proving at the time that the observations in Mexico are very acceptable.

The study of the annual march of temperature should be made by classifying under the most general types the different variations in thermal regimen found at the several stations, but in the Republic the regional influences are highly varied and it has been preferred to make this study in more detailed manner.

In Sonora and Sinaloa the march in temperature, especially that related to the 8 a. m. observation, is of the same character. At some points, such as Fuerte and Culiacan, there is observed in the systems 7, 2, 9, and 8, 8 a transition toward the types corresponding to the stations situated more to the east. In all of the region the summer stability of temperature is the greater the more the system of observation gives high temperature values, it being noted also that the annual maximum occurs earlier for the day temperatures than for those of the night and the early morning. The final result appears in much greater daily temperature ranges during the annual rise than in the annual fall in temperature.

This phenomenon is almost general in all of the country, but varies in detailed features according to individual location.

The thermal regimen for Ciudad Juarez and Ojinaga is not affected by subtropical influences and presents types peculiar to the temperate zone. The same conditions relative to the observations 7, 2, 9, and 8 a. m. are noted at Piedras Negras. At Tampico the different systems of observation show in large part the maritime type of temperature march. It is observed, however, that the 7, 2, 9 mean is much higher than the 8, 8 mean, and in the spring even higher than the mean of observations at 8 p. m. At various stations situated southwest of Tampico the same phenomenon appears; this is due to the fact that the daily maximum occurs very near the hour of 2 p. m., naturally increasing the value of the 7, 2, 9 mean.

Jalisco, Nayarit, and Colima present types similar to that of the *Mesa Central*. The maximum is recorded in May or June; there is relatively rapid temperature fall until August, and one somewhat less marked in the months following. This last feature in annual variation of temperature is that which gives in this region the difference relative to the regimen of the *Mesa Central;* the fall actually takes place so slowly that there even exists a certain tendency to renewed rise in September. In speaking of the different ways in which the "summer temperature anomaly" makes its influence felt, it has been shown that this phenomenon has its origin in the proximity of the thermal equator. Lastly, at Mascota, as at the stations of the western coast, the severity of winter is prolonged until the month of February.

In the *Mesa Central* the general type has maximum in May, fall in temperature until July, stationary condition or very slight rise in August, and uninterrupted fall in the following month. Relative to instances of transition it is observed that the annual maximum in the 8 p. m. system is advanced to April at Mexico and Puebla and that the same phase in the 8 a. m. system is retarded to June at Leon, Morelia, Queretaro, Mexico, Toluca, and Puebla, important differences in daily amplitudes for the different months resulting from these irregularities.

Leon presents extreme conditions for the *Mesa Central;* in January the amplitude of the 8 a. m. and 8 p. m. observations is 10.4° C. (18.7° F.) and in August it is 6.6° C. (11.9° F.), values much greater than those observed at Guanajuato, 8.0° and 6.0° C. (14.4°, 10.8° F.), respectively.

The temperature variations at Ulua are, in general, typical of maritime climate, the values, as has been noted, have a harmonic march in the 7, 2, 9 system. There exists, however, a certain difference between the several systems relative to the position of the maximum; in fact, there is a march opposite to that which is observed in Continental climates. The maximum for the observations at 8 a. m. occurs in May and that for observations at 8 p. m. in August. The combination of these two series of observations places the maximum for the 8, 8 system in June in agreement with the 7, 2, 9 system, but at this season of the year there is in these two means a difference in the sense of variation as is seen in the following:

Differences.	7, 2, 9.	8, 8.
	° *C.*	° *C.*
May-June	0.5	0.6
June-July	−0.1	−0.1
July-August	0.1	−0.2
August-September	−0.5	−0.5

In the southeastern part of the country, including Tabasco, Chiapas, and the peninsula of Yucatan, the systems of observation show much difference in tem-

Fig. 17. Pressure distribution, July.

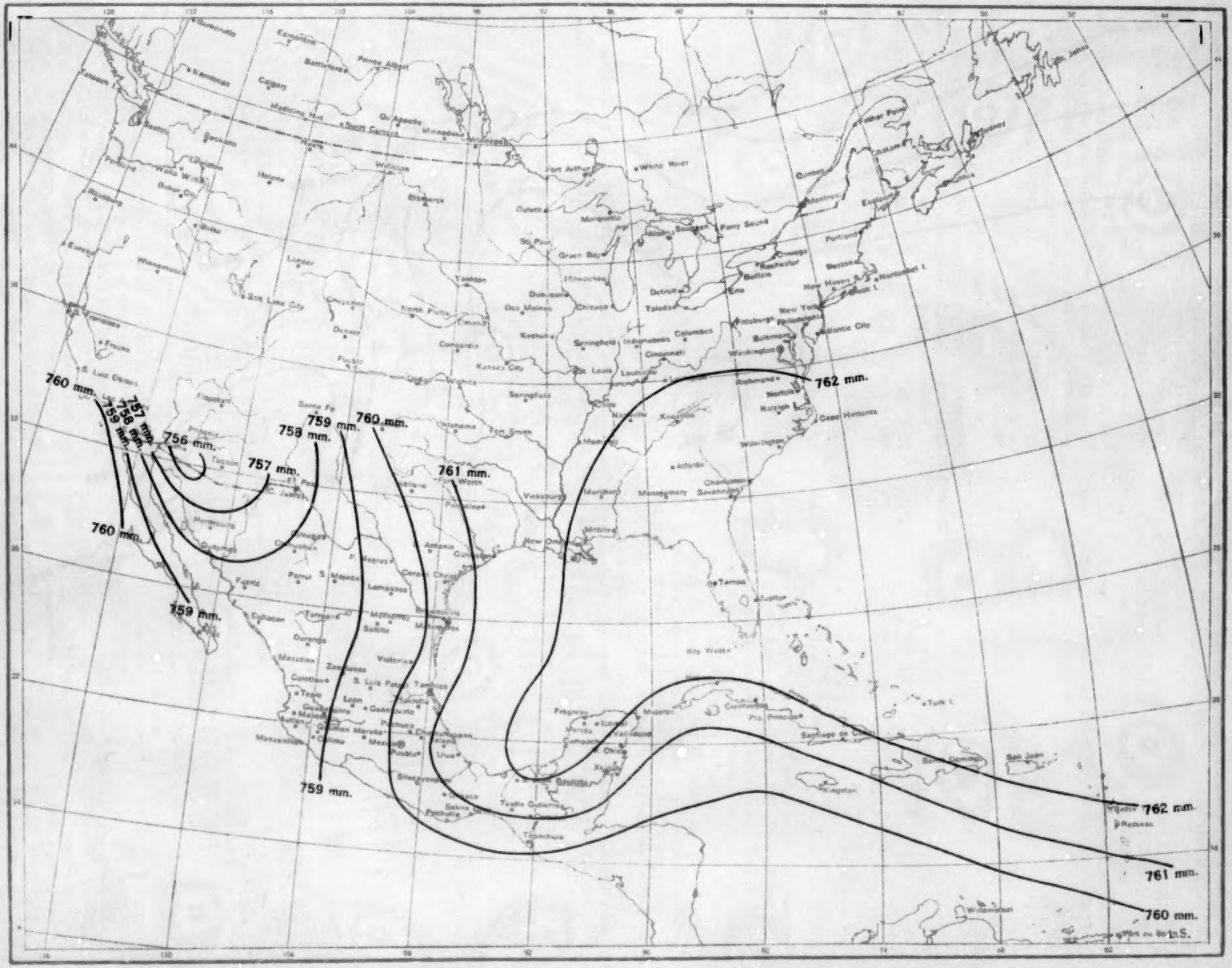
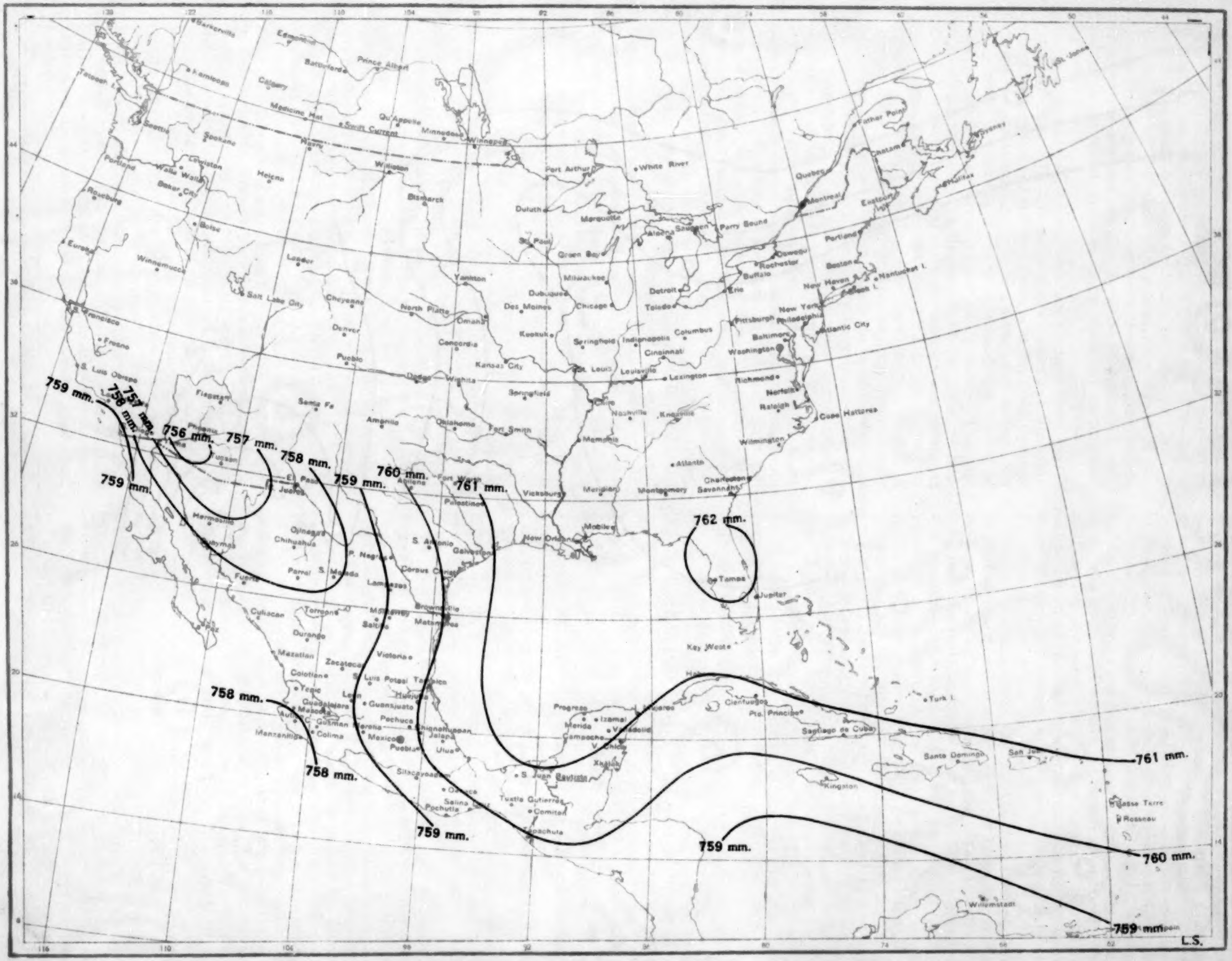


Fig. 18. Pressure distribution, August.



perature march, a condition due to the proximity of the zone in which the annual curves present a double annual oscillation. For some of the stations there is found the type similar to that of the *Mesa Central*, but the values obtained by the different systems show noticeable difference for the same place.

San Juan Bautista has the thermal type noted for the *Mesa Central*, the amplitude, however, is naturally much smaller on account of location and latitude. At Maxcanu, Peto, and Izamal, stations affected by continental influence, the thermal type also resembles that of the *Mesa Central*, the 7, 2, 9 system giving in some months of the year values higher than those found for 8 p. m., as is observed at Jalapa, Huejutla, and other stations.

At Merida and Valladolid the thermal régime approaches similarly to the type for maritime stations, but with the peculiarity noted for the stations just mentioned.

The thermal regimen is typically maritime at Progreso, Vigia Chico, Isla Mujeres, and Xkalak. During the entire year the 7, 2, 9 temperature at Xkalak is higher than that given for observations at 8 p. m. This phenomenon, occurring in a more or less marked manner in all the region that is studied, is due to the fact that the 8 p. m. (75th meridian) observations are made at 7 p. m. local time, when the wind blows from the first quadrant lowering the temperature.

The State of Chiapas is that in which the proximity of the thermal equator manifests its influence most intensely at all stations and in different manner, especially relative to the 8 a. m. and 8 p. m. observations. It is to be noted, however, that there is general agreement in annual march for the values of the means of the two systems, 7, 2, 9 and 8, 8.

The maxima and the minima occur as follows:

	Maxima.		Minima.	
	I.	II.	I.	II.
Tapachula	April	November	January	September.
Comitan	May	September	do	August.
San Cristobal	do	do	do	Do.
Tuxtla-Gutz.	do	do	do	Do.

In order that their importance may be appreciated the extreme values in this double oscillation are given below in terms of departure from the annual mean.

	Maxima.				Minima.			
	I.		II.		I.		II.	
	7, 2, 9.	8, 8.	7, 2, 9.	8, 8.	7, 2, 9.	8, 8.	7, 2, 9.	8, 8.
	°	°	°	°	°	°	°	°
Tapachula	1.5	1.7	0.1	0.3	−0.1	−1.7	−0.9	−1.1
Comitan	2.4	1.8	0.8	0.7	−2.5	−2.8	0.4	0.4
San Cristobal	2.3	1.7	0.9	1.0	−2.8	−3.2	−0.7	−0.7
Tuxtla-Gutz.	1.5	2.5	1.1	1.0	−3.1	−3.1	0.7	0.8

At Tapachula and Comitan, as at the stations in the peninsula of Yucatan, the mean of the 7, 2, 9 system gives for some periods of the year values higher than those given by the other systems.

There is observed at the stations in the State of Oaxaca also some difference as to details in temperature types.

At Pochutla the annual march given by the different systems exhibits much analogy to that observed for the stations in the State of Chiapas.

Salina Cruz shows a march that is essentially maritime, with a slight double annual oscillation of the equatorial type.

Tuxtepec, Oaxaca, Silacayopan, and Cuernavaca (Morelos), possess a type similar to that found in the *Mesa Central*, but having smaller daily amplitude.

The different periods in which the monthly values given by the 7, 2, 9 system are higher than those in the 8 p. system may be classified thus:

Stations.	7, 2, 9 > 8 p.
Tampico	March–July.
Huejutla	May.
Chignahuapan	May–November.
Jalapa	April–May.
Merida	July–October.
Progreso	June–July.
Peto	Do.
Izamal	June–November.
Valladolid	May–November.
Vigia Chico	August–September.
Xkalak	January–December.
Tapachula	August–September.
Comitan	February, May, June, September.
Tuxtepec	November.
Pochutla	August.

From the preceding table it is seen that the means from the 7, 2, 9 system are higher than those from the 8 p. m. system at the first four stations at one period of the year and higher at another period at the remaining stations, a fact that leads to the belief that the causes that produce this condition are distinct, as has already been shown in previous discussion. The circumstance that there are at Zacatecas two stations with different topographical situation permits a comparative study of the two causes.

One of the stations is in the city proper, at the *Instituto del Estado*, at an elevation of 2,443 meters, and the other is on Bufa Hill, at an elevation of 2,611 meters above sea-level. The difference in elevation is 168 meters.

In the small table below there is given a comparison of the temperature values corresponding to observations at 8 a. m. and 8 p. m., means for the 8, 8 system, and differences between a. m. and p. m. means. And these values are presented graphically in Figure 19.

I—8 a. m.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Instituto	5.7	6.7	8.9	11.3	13.3	13.2	12.1	12.3	11.4	9.5	7.7	6.2	9.9
Bufa	7.5	8.4	9.7	11.1	12.4	12.9	11.8	11.8	10.7	9.3	8.5	8.0	10.2
Difference	1.8	1.7	0.8	−0.2	−0.9	−0.3	−0.3	−0.5	−0.7	−0.2	0.8	1.8	0.3

II—8 p. m.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Instituto	12.2	14.0	16.7	19.3	20.9	20.2	17.6	17.6	16.6	15.4	14.2	13.1	16.5
Bufa	12.2	13.3	16.2	18.5	19.6	18.9	17.3	17.2	16.2	15.0	13.9	12.9	15.9
Difference	0.0	−0.7	−0.5	−0.8	−1.3	−1.3	−0.3	−0.4	−0.4	−0.4	−0.3	−0.2	−0.6

III—8, 8.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Instituto	9.0	10.4	12.8	15.3	17.1	16.7	14.8	15.0	14.0	12.4	11.0	9.6	13.2
Bufa	9.8	10.8	13.0	14.8	16.0	15.9	14.6	14.5	13.4	12.2	11.2	10.4	13.0
Difference	0.8	0.4	0.2	−0.5	−1.1	−0.8	−0.2	−0.5	−0.6	−0.2	0.2	0.8	−0.2

IV—8 a. m.-8 p. m.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Instituto	6.5	7.3	7.8	8.0	7.6	7.0	5.5	5.3	5.2	5.9	6.5	6.9	6.6
Bufa	4.7	4.9	6.5	7.4	7.2	6.0	5.5	5.4	5.5	5.7	5.4	4.9	5.8
Difference	−1.8	−2.4	−1.3	−0.6	−0.4	−1.0	0.0	0.1	0.3	−0.2	−0.9	−2.0	−0.8

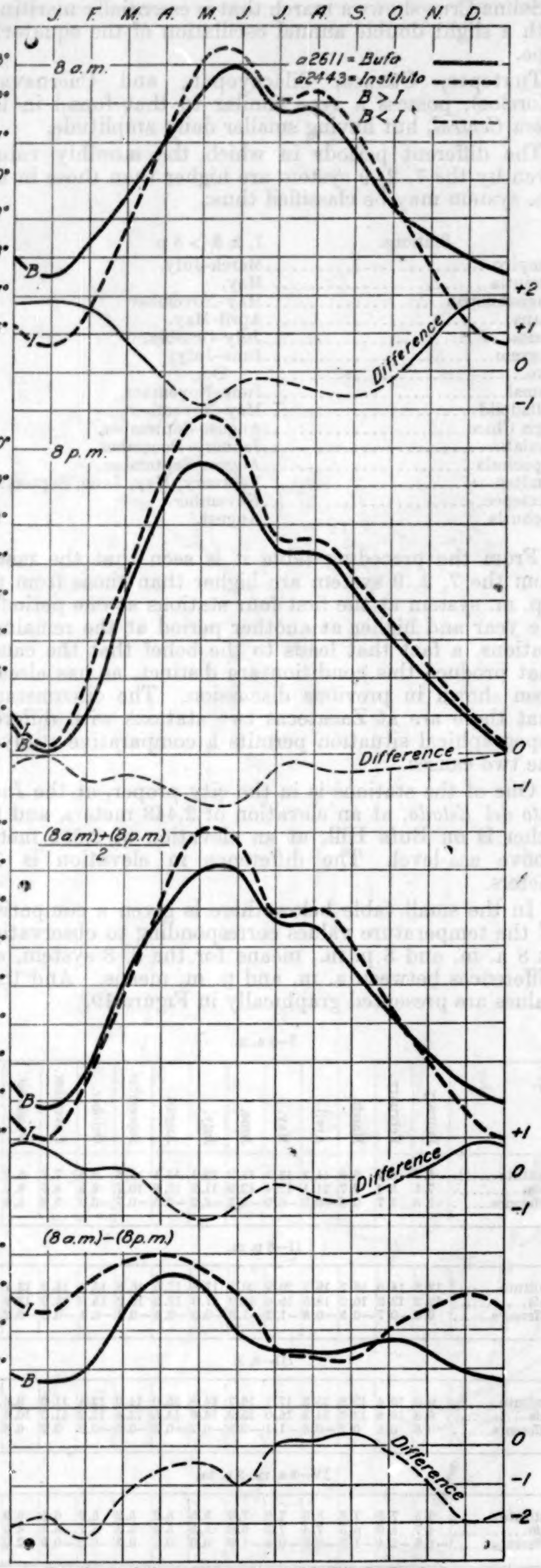


FIG. 19.—Variations of temperature with altitude, Zacatecas.

An outline has been given of the causes that modify the normal temperature march for the day or for the year, it being noted that latitude, elevation, topographical situation, and Continental location are the chief controls.

If, for example, there are taken two stations that have the same conditions of location with the exception of topography, and if one is situated in the bottom of a valley and the other on the crest of a mountain, the amplitude in temperature will be greater in the first case than in the second. It is evident that on the plains where there is continual renewal of the air the amplitude is relatively reduced, it being established that the cause that modifies amplitude in the deep valleys is due to reflection of heat by the mountains or lesser prominences during the day and to an opposed phenomenon during the night, which results in there being recorded greater oscillations in temperature than would occur if there were greater facility for the renewal of air supply.

This phenomenon is generally observed to conform to other conditions with the result that the daily amplitude is greater where the terrain has concave form and smaller in the opposite case.

It is known that the temperature of the ground is the main factor controlling temperature variations in the lower strata of the atmosphere, the influence of soil radiation, and consequently amplitude in temperature, diminishing with elevation above the ground.

At Zacatecas this phenomenon is observed very clearly. In the absence of maximum and minimum values an idea can be got by comparing the observations of 8 a. m. and 8 p. m. These have an amplitude of 6.6° C. (11.9° F.) at the *Instituto* and 5.8° C. (10.4° F.) at Bufa Hill; there is variation from these annual values in the different months and consequently variation in the difference in amplitude. The differences are 2.4° C. in February, 0.0° in July, 0.1° in August, and 0.3° in September, the amplitude being smaller at the lower station in the last two months. The extreme values of difference in amplitude occur in February and September and it has been observed that they coincide with the least and the greatest values for atmospheric humidity.

If the annual amplitudes are considered there is found in the curve for 8 a. m. 7.6° C. (13.7° F.) at the *Instituto* and 5.4° C. (9.7° F.) at Bufa; in the curve for 8 p. m., 8.7° and 7.4° C. (15.7°, 13.3° F.); in the mean for 8.8, 8.1° C. (14.6° F.) in the city and 6.2° C. (11.2° F.) on the mountain (see Fig. 19), all these are facts that set forth anew what is known relative to mountain and valley exposures.

Likewise the resultant difference between the values at the one station and at the other is not constant during the different periods of the year. This is natural since with smaller daily amplitudes generally recorded at Bufa that station will have higher winter temperatures than the *Instituto* and conditions will be reversed in summer.

In the observations at 8 a. m. for example, as is seen from the data the temperature at Bufa is higher than that at the *Instituto* from November to March and lower during the remainder of the year. For the observations at 8 p. m. the temperature at Bufa is lower during the entire year, the differences being −1.3° C. (2.3° F.) in July and 0.0° in January. In these cases on account of marked temperature rise during the day it happens that heat has accumulated at the surface while this has not occurred at the summit of the mountain, the temperature falling at that point soon after the sun begins to decline on account of the continual renewal of air.

Fig. 20. Surface isotherms (°C.), January (7+2+9)/3.

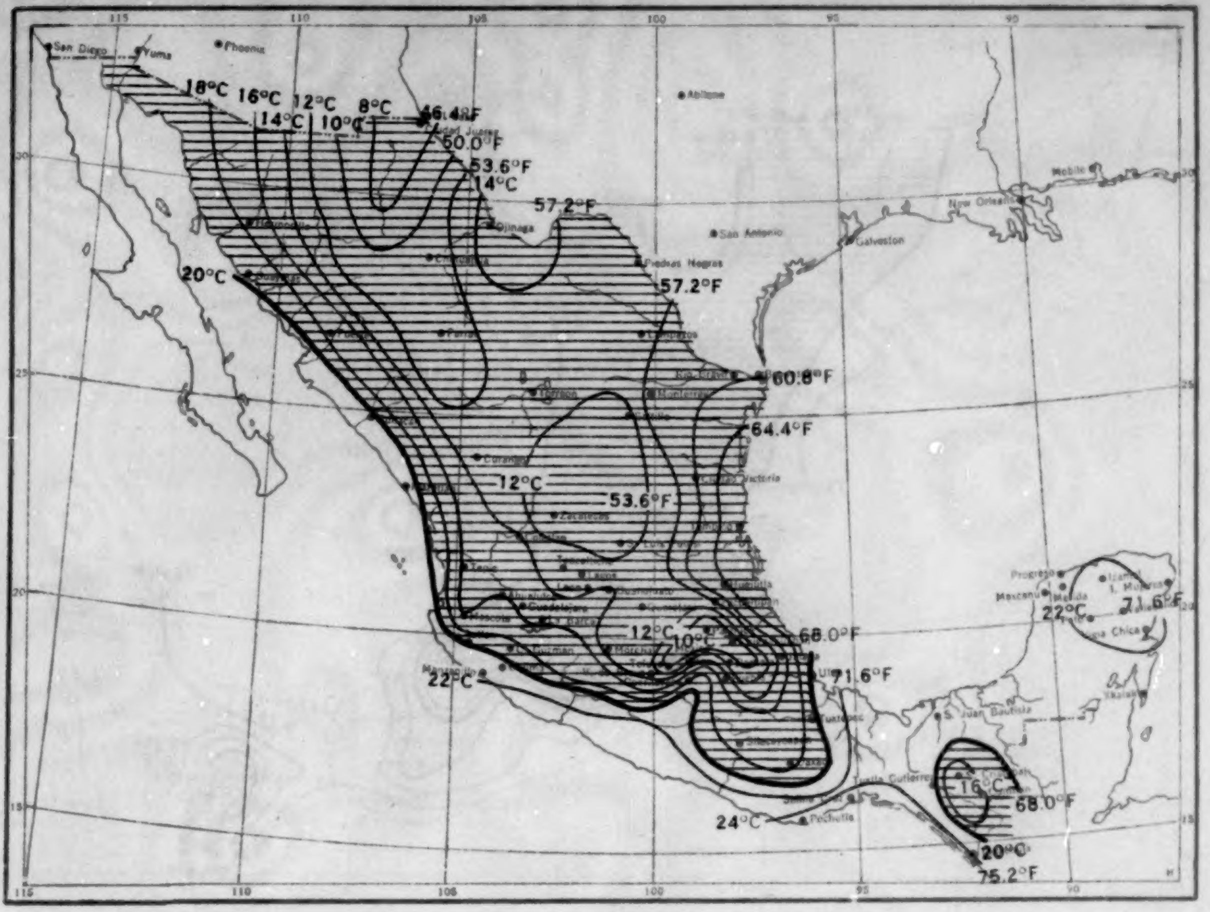


Fig. 21. Surface isotherms (°C.), February (7+2+9)/3.

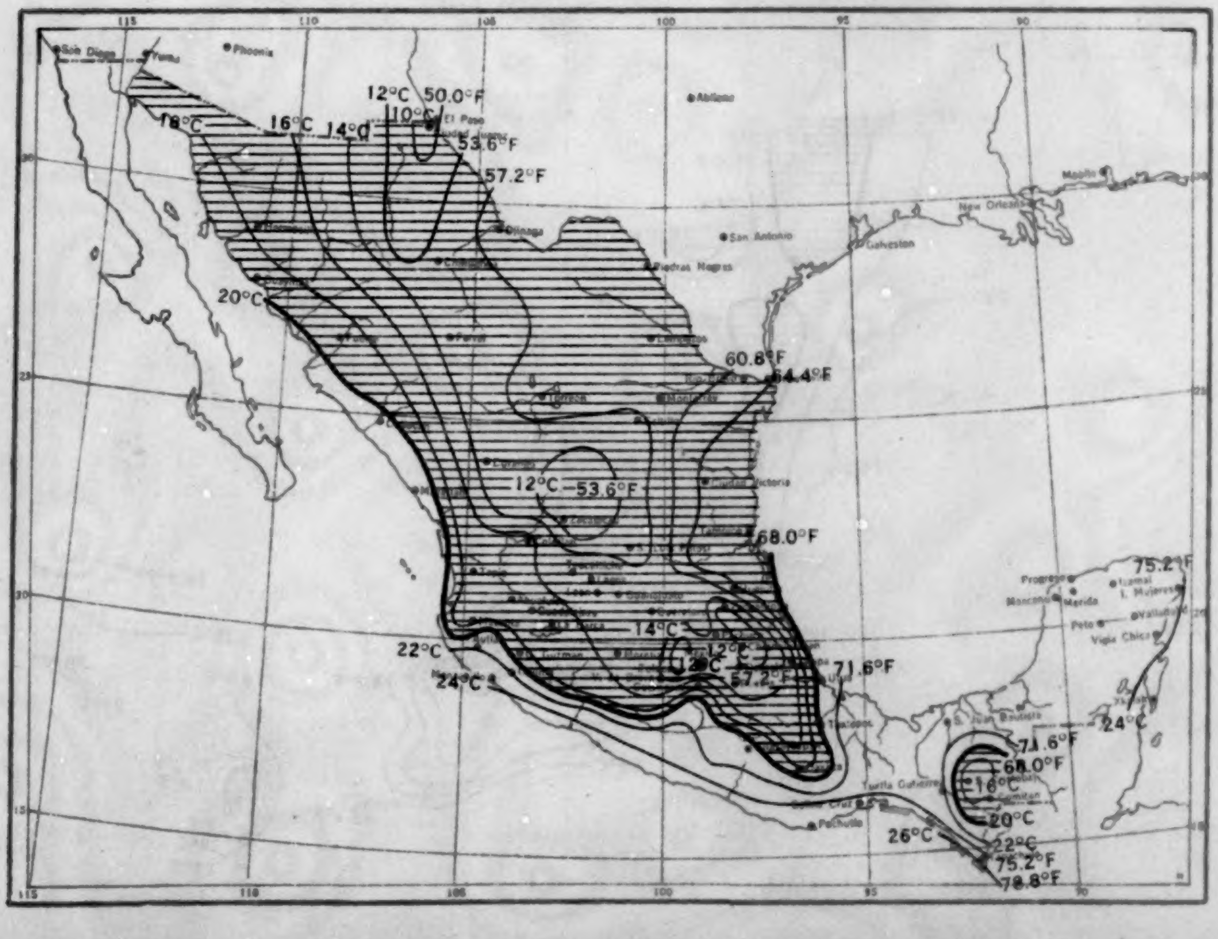


Fig. 22. Surface isotherms (°C.), March (7+2+9)/3.

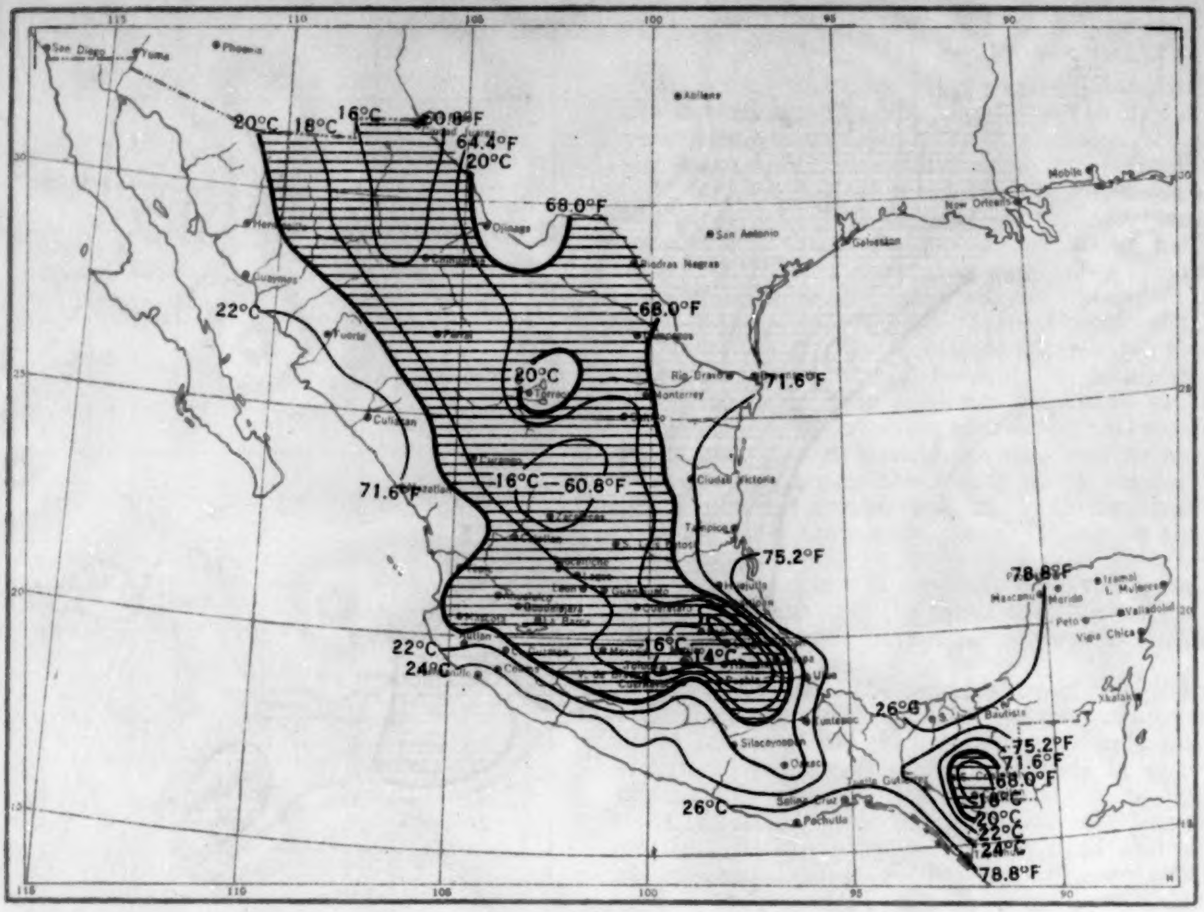


Fig. 23. Surface isotherms (°C.), April (7+2+9)/3.

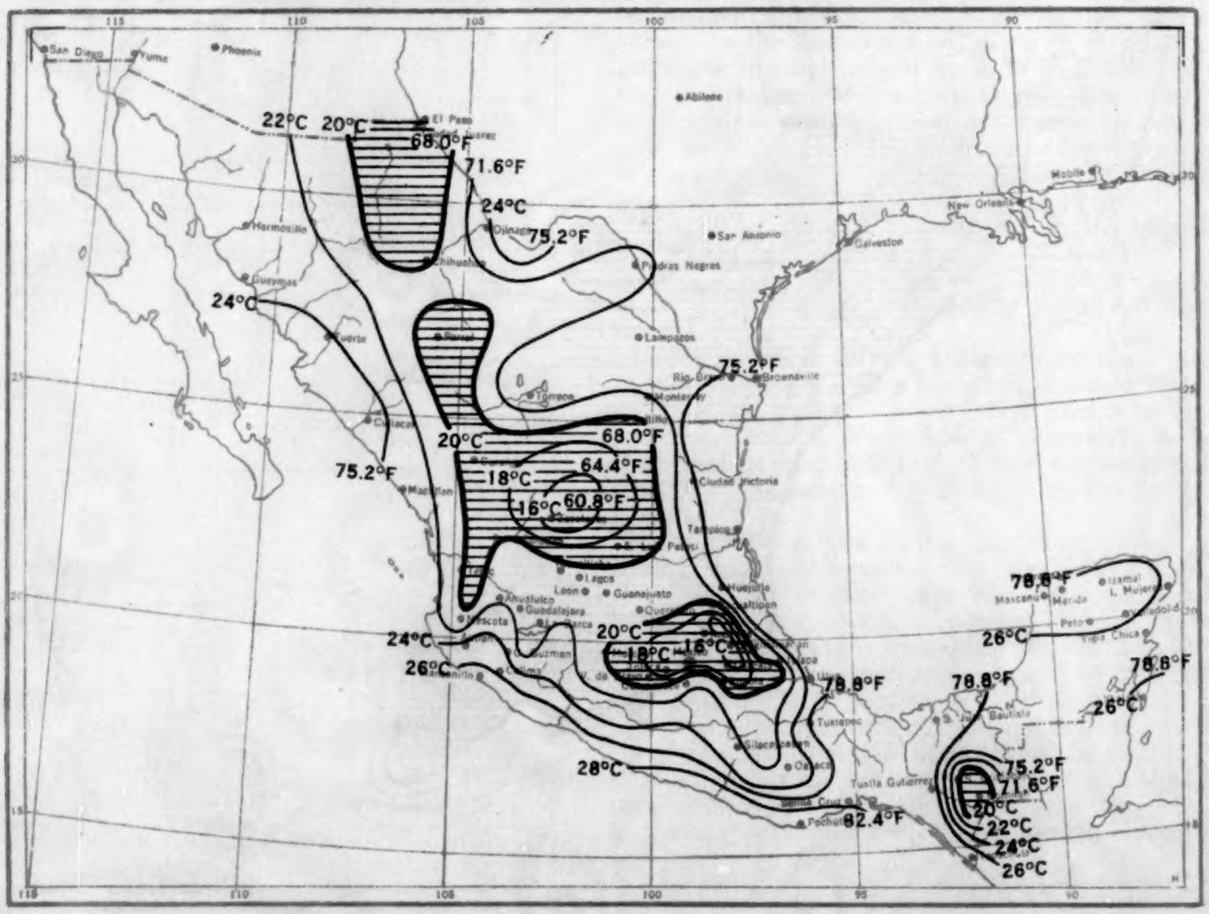


Fig. 24. Surface isotherms (°C.), May (7+2+9)/3.

Fig. 25. Surface isotherms (°C.), June (7+2+9)/3.

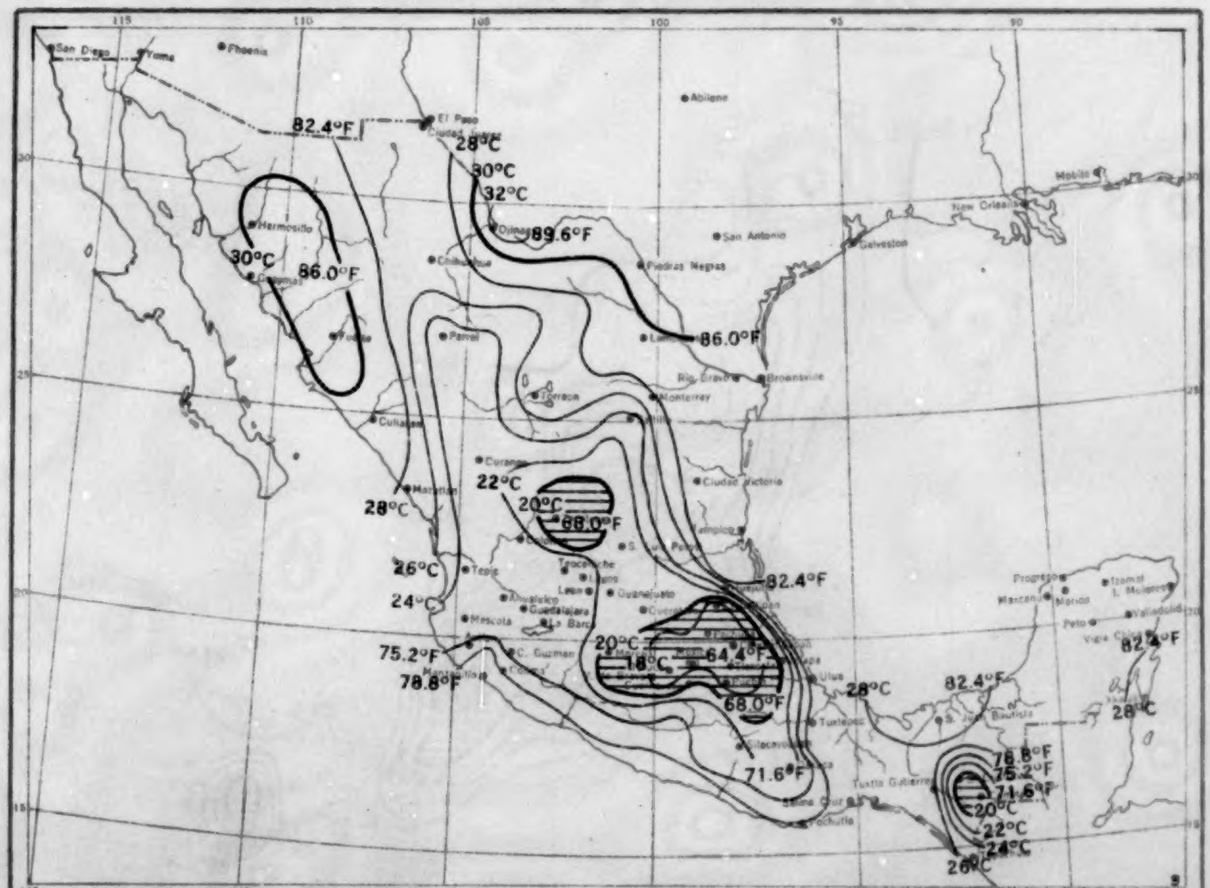


Fig. 26. Surface isotherms (°C.), July (7+2+9)/3.

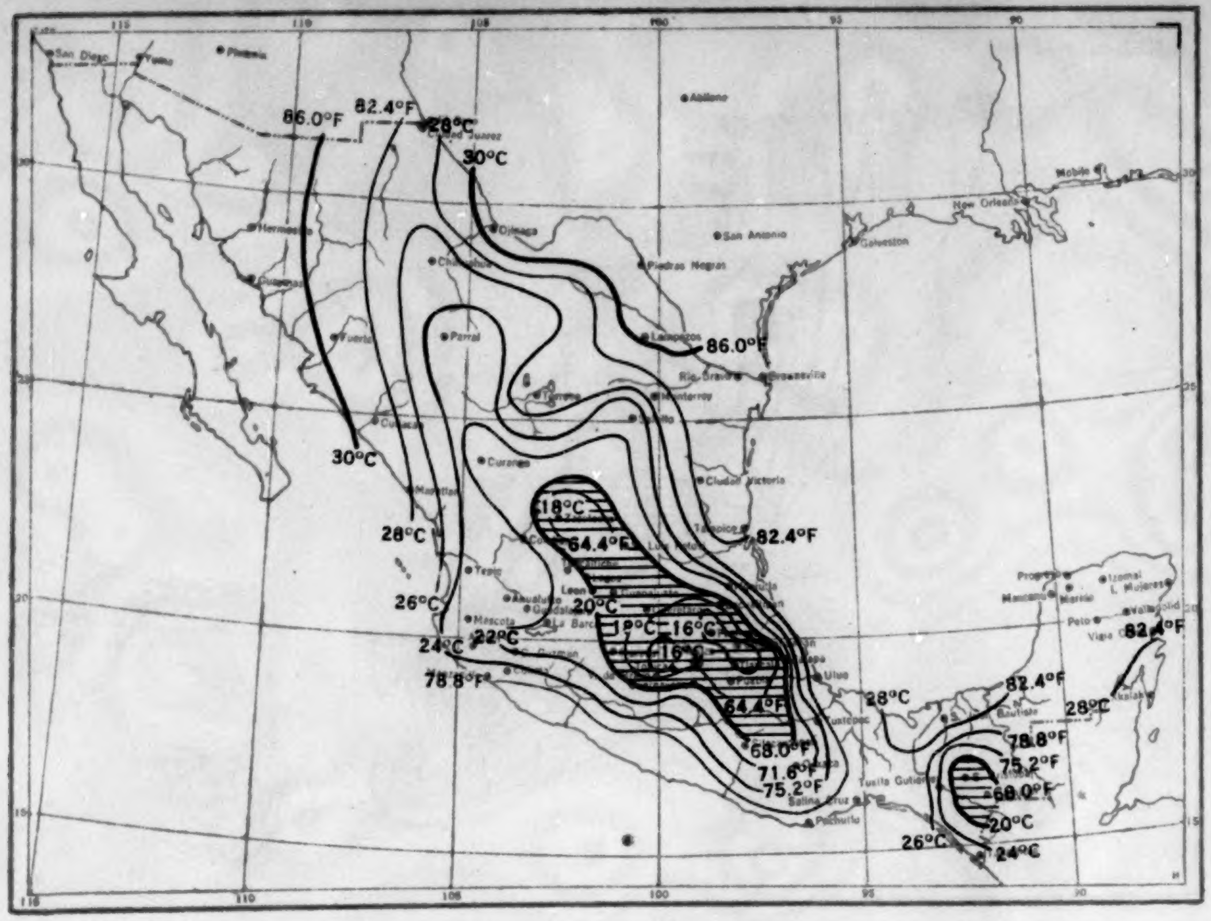


Fig. 27. Surface isotherms (°C.), August (7+2+9)/3.

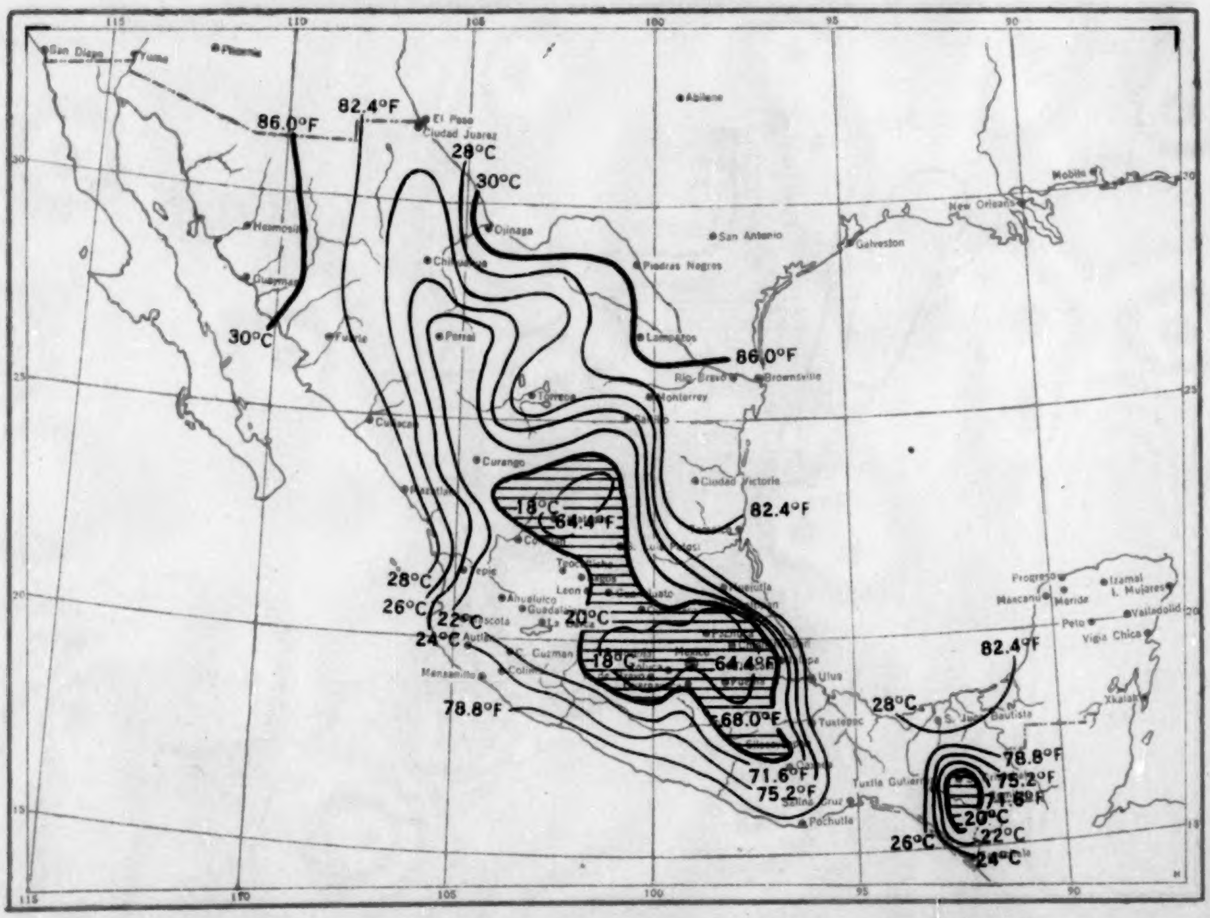


Fig. 28. Surface isotherms (°C.), September (7+2+9)/3.

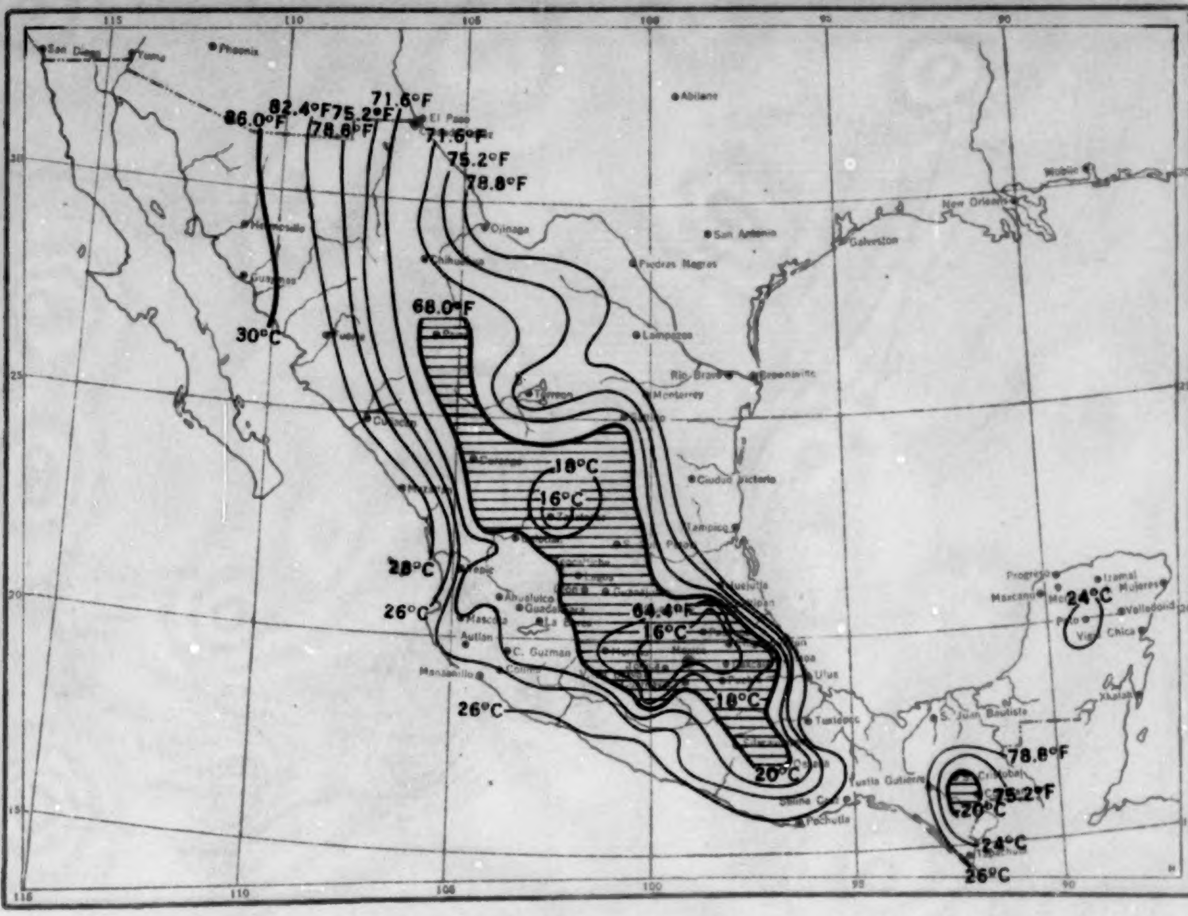


Fig. 29. Surface isotherms (°C.), October (7+2+9)/3.

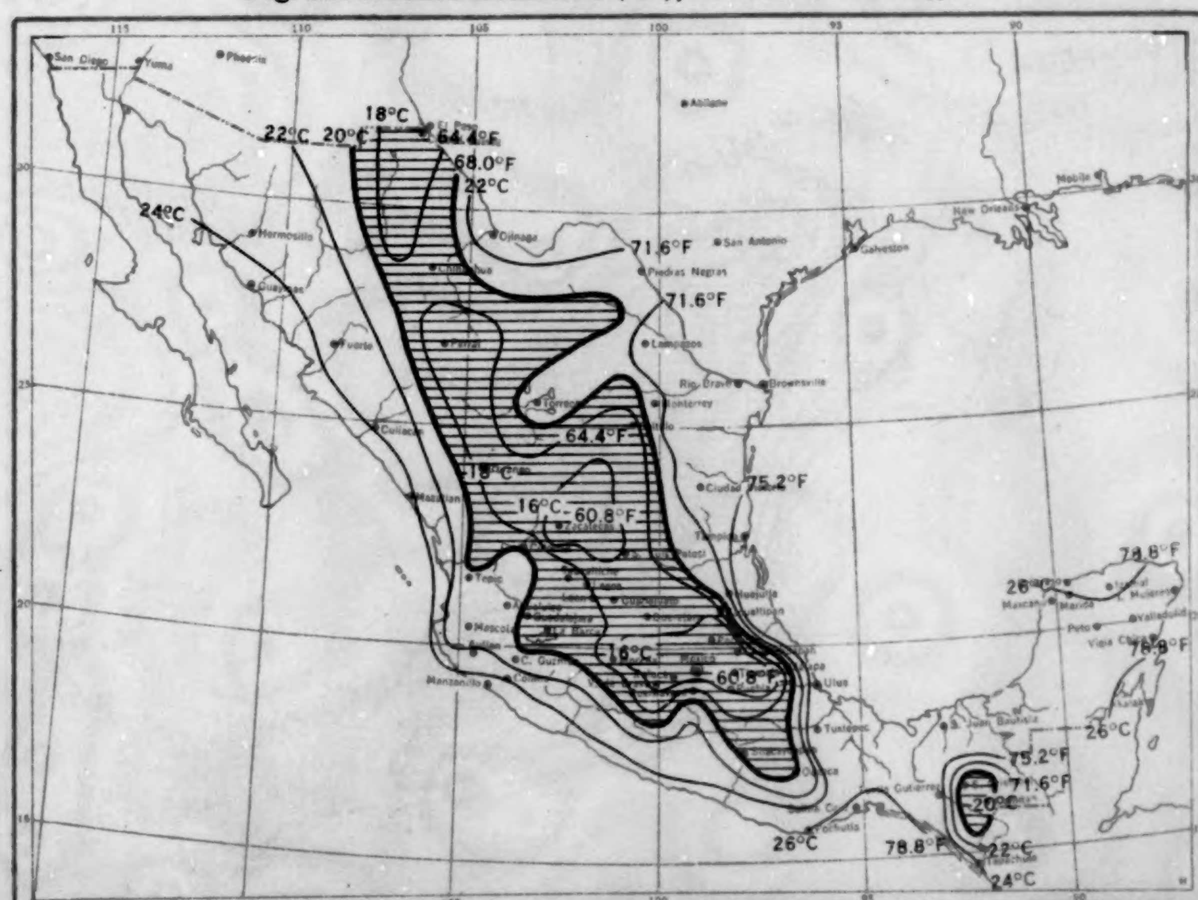


Fig. 30. Surface isotherms (°C.), November (7+2+9)/3.

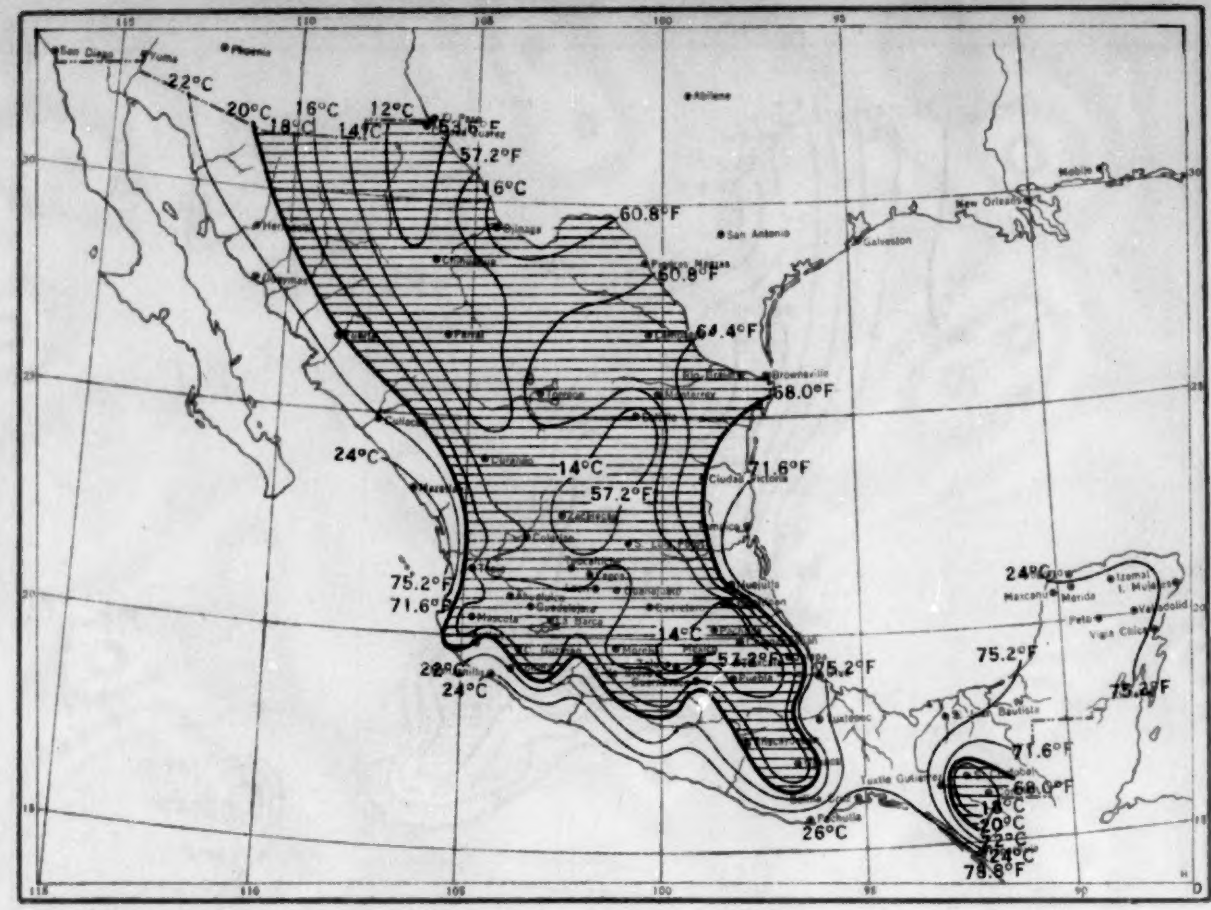


Fig. 31. Surface isotherms (°C.), December (7+2+9)/3.

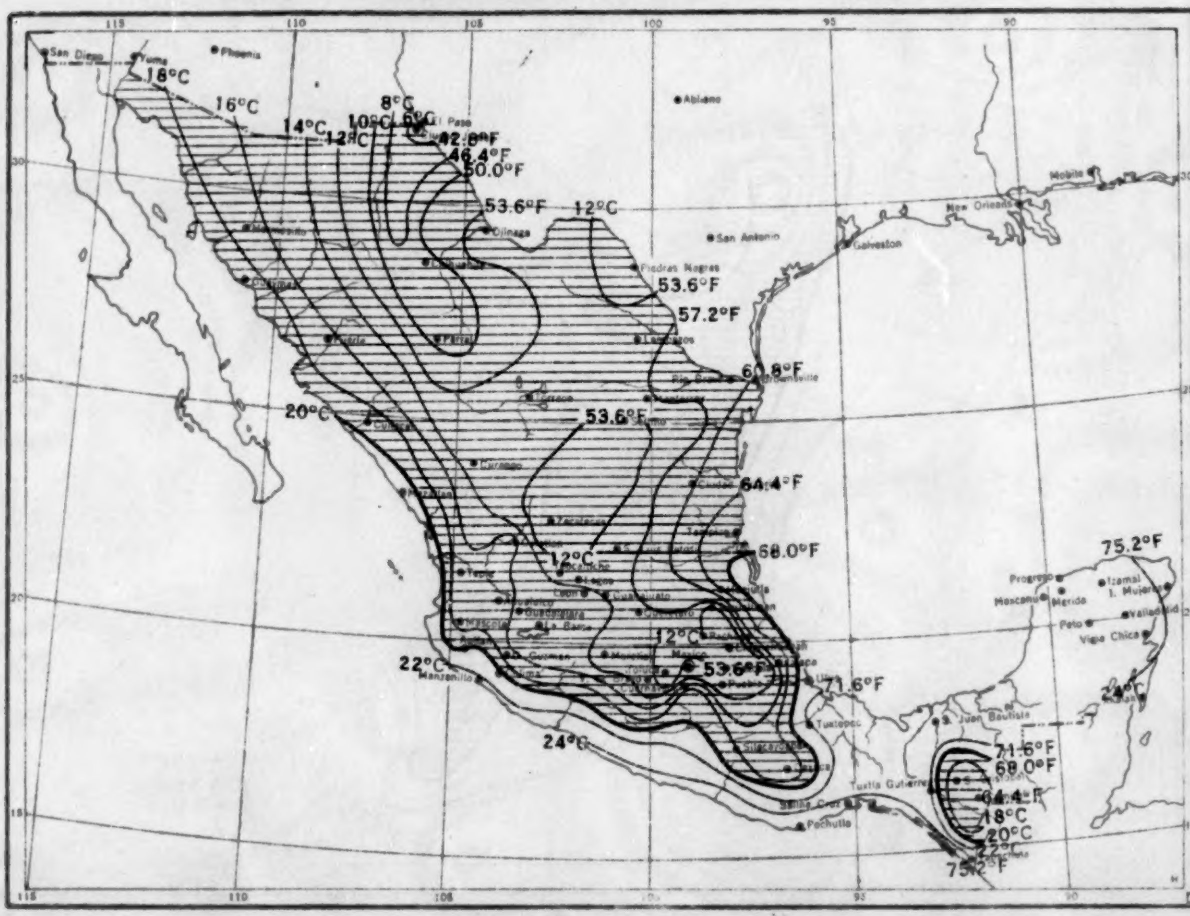
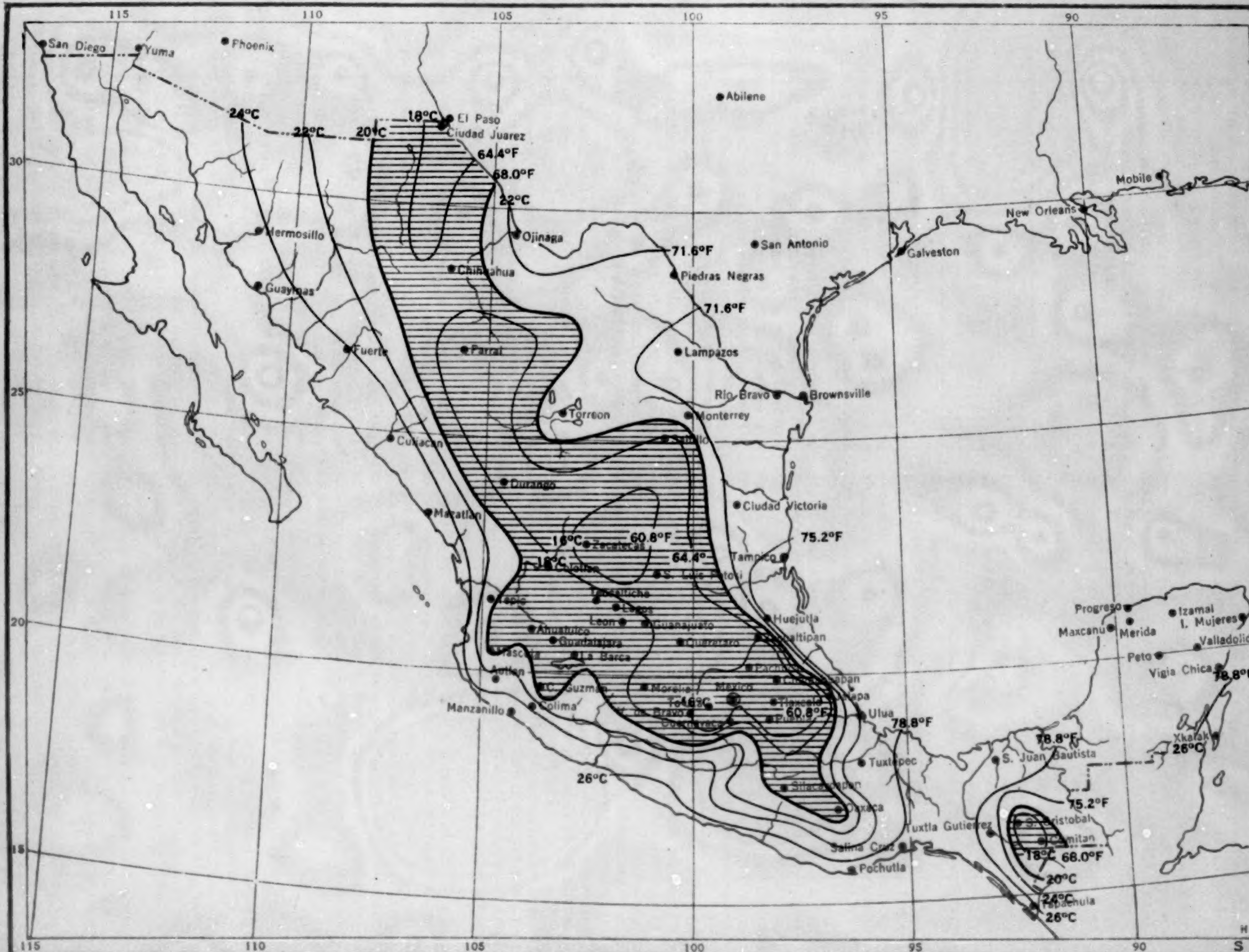


Fig. 32. Surface isotherms (°C.), Year (7+2+9)/3.



In the winter, on the other hand, the sun sets very early in the city, the losses through radiation begin quickly and the temperatures at the two places tend to become equal a little before the 8 p. m. observation.

In the mean for the 8, 8 system the effects are compensated, but there is seen, with lower values, however, the same phenomenon observed for the observations of 8 a. m. In general the temperature is higher at Bufa from November to March and lower at that station from April to October.

The differences between annual means are as follows:

	8 a. m.	8 p. m.	8, 8.
Instituto	9.9	16.5	13.2
Bufa	10.2	15.8	13.0
Difference	0.3	−0.7	−0.2

SURFACE ISOTHERMS.

As the completion of the study of the annual variation in temperature Figures 20–32 have been drawn from the values of the 7, 2, 9 means. (Table 2.) These present the surface isotherms.

On the whole it is clearly seen from this series of charts that elevation is the dominant influence. Thus, in the chart of annual isotherms it is noted that the temperatures are highest along the coasts, while the minimum temperature values are grouped about the elevated regions, there being very noticeable absence of latitude effect, which is barely appreciable at the north. At Ciudad Juarez, for example, although its latitude is 32° and its elevation is 1,134 meters, the annual temperature is 4° C (7.2° F.) higher than that at certain points in the *Mesa Central*, the *Mesa del Norte*, and Chiapas.

On this annual chart the hottest region is found on the Isthmus of Tehuantepec (Salina Cruz, 26.9° C. or 80.4° F., San Juan Bautista, 26.2° C. or 79.2°F.), on the coasts of Guerrero, Oaxaca, and Chiapas, and at some points in Quintana Roo. (Xkalak, 26.4° C. or 79.5° F.). On the other hand in the centers of cold there are noted the following: In the *Mesa del Norte*, Zacatecas, 14.3° C. (57.7° F.); in the *Mesa Central*, Toluca, 12.6° C. (54.7° F.) and Chignahuapan, 12.4° C. (54.3° F.); in Chiapas, San Cristobal, 13.0° C. (55.4° F.). There exist, however, in the country places that are hotter and those that are colder for which no data are available, but in those cases purely local conditions are the influences producing such extremes.

Referring to the isotherms for January it is seen that nearly all of the country lies within the curve of 20° C. (68° F.), there being noted among the exceptions the coasts of the Pacific, the Isthmus, and parts of the States of Tabasco and Yucatan. In this chart also there becomes appreciable the influence of latitude, this is true especially in the northern region, where low temperatures prevail (Ciudad Juarez, 6.9° C. or 44.4° F.). The maximum values are noted on the coasts of Oxaca and Chiapas with means above 24° C. (75.2° F.).

With the course of the year the temperatures rise continually until the maximum for the year is reached. It has been seen in what manner this occurs in different regions in Mexico.

In March temperatures below 10° C. (50° F.) disappear; in May only in limited portions of the *Mesa Central*, the *Mesa del Norte*, and Chiapas values below 20° C. (68° F.) remain, this being the month in which temperatures are highest in the *zona fria*. In June, in the northern and northeastern regions of the country, important areas in which the temperature reaches values above 30° C. (86° F.), (Ojinaga, 30.8° C. or 87.4° F.) appear.

In July the temperature has begun to fall noticeably in different regions; in all of the high plain (*meseta*) temperatures are generally below 20° C. (68° F.), but in the northern and northwestern regions the isotherms of 30° C. (86° F.) remains. In the maritime region the temperature is above 26° C. (78.8° F.) and north of latitude 22° and in some parts of Tabasco and Quintana Roo it is above 28° C. (82.4° F.). In a general way this situation continues in the month of August.

In September the temperature falls considerably in the central and eastern parts of the country, particularly on the high plain (*meseta*) and in Chiapas. In the northwestern region there yet remains the isotherm of 30° C. (86° F.), the maximum values for that region occurring in this month.

In October the temperature situation is found completely changed by reason of general fall, and the chart presents the peculiarity of an extraordinary similarity to the annual chart both as to values and configuration of the isotherms.

The isotherms of 10° C. (50° F.) reappear in the high regions in December. This is naturally true for the northern region because the annual minimum is recorded in this month, and the isotherm of 6° C. (42.8° F.) is found in the vicinity of Ciudad Juarez. The maximum values (24° C. or 75.2° F.) are found in a narrow strip along the southern Pacific coast and in small areas in Quintana Roo.

It is seen that the minimum values of temperature due to elevation are observed without interruption in the elevated regions of Chiapas and the *Mesa Central*. On account of latitude, especially in the State of Chihuahua, in the months from November to March temperatures in the northern region are as low as in the regions just mentioned and even lower in midwinter. In the *Mesa del Norte* both causes manifest their influence in an almost permanent area of minimum temperature.

Maximum temperatures, on the other hand, show irregular distribution over the country during the year, occurring successively from the southern to the northern part of the Republic as the season advances to midsummer and then reversing the course.

It is to be noted that in the arid region of the *Bolson de Mapimi* relatively high temperatures are recorded, as appears from observing the isotherms that are bent toward the interior of the continent in the area. Later in the discussion of temperature gradient with elevation it will be seen that this is due to marked thermal inversion in this region, and explanation of this will be given in that connection.

PART II.

Temperature variations in the City of Mexico.

Until 1916 the central office of the *Servicio Meteorologico* of the Republic of Mexico was located in the City of Mexico; for this reason and, further, since it is the only point in the country where hourly observations have been made, it has been deemed proper to set forth in detail the march in temperature with regard to different phases.

The lack of data relative to hourly temperature values at other places in the Republic prevents comparisons that might aid in determining the local causes that influence diurnal variation in temperature.

Since it has been impossible, moreover, to collect maximum and minimum temperatures for the different sta-

tions of the country, all matters related to these temperature elements will remain obscure.

Outside of Mexico the nearest meteorological stations at which hourly observations have been made are San Diego, Santa Fe, and Galveston in the United States, and Habana, Cuba, points with which there can be made only a superficial comparison that does not approach a clear determination of the influences exerted by geographical situation and topography.

The City of Mexico, situated in the valley of the same name, has the following geographic coordinates: Latitude, 19° 26′ 4″ N., longitude, 99° 11′ 25″ W. The elevation above sea level is 2,240 meters (7,349 feet). The observatory, removed in 1916 to the city of Tacabaya, was located from the beginning on the grounds of the *Palacio Nacional;* the temperature readings that have been used in this study relate to that location.

Table 5 presents the hourly temperature values for Mexico for each month of the year and Figures 33–35 the series of curves drawn from those values.

The course of the curves that represents graphically the diurnal march of temperature has the general features that correspond to conditions in middle and tropical latitudes. The temperature rises uniformly from the minimum, whose time of occurrence coincides more or less with the rising of the sun. This ascending movement carries the curve to the maximum, which occurs, on an average, at 3 p. m. The temperature then falls continuously, but with less rapid change than during its rise, until the minimum of the following day.

TABLE 5.—*Mean hourly temperatures, Mexico City.* (°C.)

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1 a. m.	8.9	10.8	12.5	14.3	14.8	14.8	14.3	14.3	13.9	12.4	11.4	9.5	12.66
2 a. m.	8.4	10.2	11.9	13.7	14.5	14.5	14.0	14.0	13.6	12.1	10.9	9.1	12.24
3 a. m.	7.9	9.6	11.3	13.2	14.1	14.1	13.7	13.6	13.4	11.9	10.6	8.6	11.83
4 a. m.	7.4	9.0	10.6	12.6	13.6	13.8	13.4	13.4	13.1	11.6	10.2	8.2	11.41
5 a. m.	6.9	8.5	10.1	12.2	13.3	13.6	13.2	13.2	12.9	11.3	9.8	7.8	11.07
6 a. m.	6.5	8.1	9.7	12.0	13.3	13.6	13.4	13.2	12.8	11.2	9.6	7.5	10.91
7 a. m.	6.5	7.9	10.2	12.8	14.3	14.6	14.0	13.8	13.3	11.4	9.8	7.6	11.35
8 a. m.	7.3	9.0	11.4	14.2	15.7	15.7	14.9	14.7	14.3	12.4	10.7	8.5	12.40
9 a. m.	8.8	11.3	13.5	16.1	17.7	17.2	16.6	16.2	15.5	13.5	12.3	9.9	14.05
10 a. m.	11.0	13.3	15.9	18.9	19.6	18.9	18.1	17.7	16.9	15.1	14.2	11.9	15.96
11 a. m.	13.0	15.5	18.3	20.9	21.3	20.4	19.5	19.0	18.1	16.7	15.9	13.7	17.69
12 noon	14.9	17.3	20.0	22.4	22.8	21.5	20.6	20.2	19.4	18.0	17.5	15.4	19.17
1 p. m.	16.3	18.6	21.2	23.5	23.6	22.6	21.3	21.2	20.4	19.1	18.5	16.7	20.25
2 p. m.	17.3	19.5	22.2	23.9	24.0	23.3	21.8	21.8	21.1	19.6	19.2	17.6	20.96
3 p. m.	18.0	20.1	22.3	24.0	23.9	23.2	21.8	21.5	21.1	19.8	19.4	17.9	21.08
4 p. m.	17.8	19.6	21.6	23.4	23.1	22.1	20.7	20.8	20.2	19.5	19.0	17.7	20.41
5 p. m.	17.2	19.2	20.4	22.3	21.8	20.9	18.9	19.6	18.9	18.7	18.1	16.8	19.40
6 p. m.	15.7	17.5	19.0	20.2	20.2	19.4	17.8	18.3	17.5	17.3	16.6	15.1	17.88
7 p. m.	14.3	15.9	17.7	18.8	18.8	18.3	16.9	17.2	16.6	16.3	15.3	14.0	16.67
8 p. m.	13.0	14.9	16.5	17.7	17.9	17.3	16.3	16.5	16.0	15.3	14.3	12.9	15.72
9 p. m.	11.9	13.9	15.6	16.9	17.2	16.6	15.8	15.8	15.4	14.4	13.4	11.9	14.90
10 p. m.	11.0	13.0	14.6	16.1	16.5	16.1	15.3	15.3	15.0	13.8	12.8	10.9	14.20
11 p. m.	10.3	12.2	13.8	15.3	15.9	15.6	14.9	14.9	14.6	13.3	12.2	10.3	13.61
12 p. m.	9.4	11.5	13.2	14.7	15.3	15.2	14.6	14.5	14.1	12.8	11.6	9.8	13.06
Mean	11.57	13.61	15.56	17.50	18.05	17.64	16.74	16.68	16.17	14.89	13.89	12.06	15.36

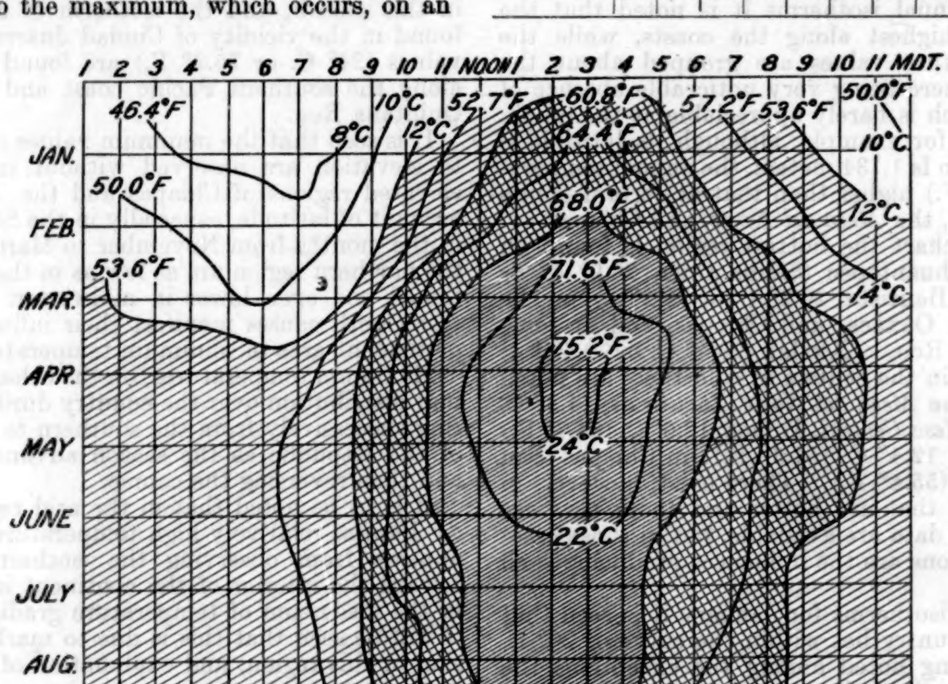


FIG. 33.—Isopleth, City of Mexico.

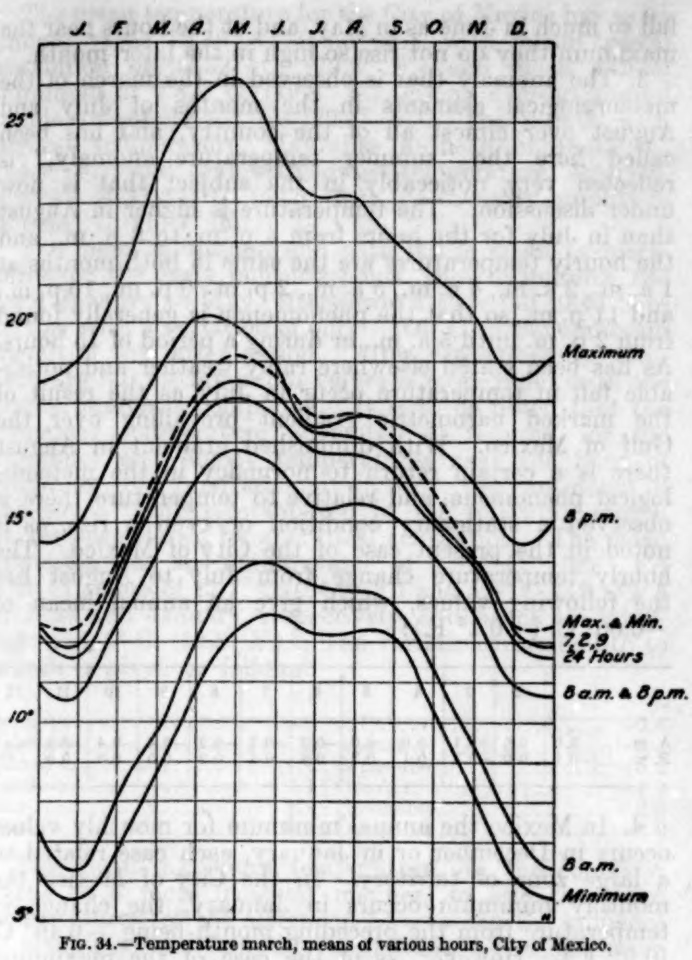


FIG. 34.—Temperature march, means of various hours, City of Mexico.

TABLE 6.—*Mean temperatures, Mexico City.* (°C.)

	January.	February.	March.	April.	May.	June.
Mean, 24 hours	11.57	13.61	15.56	17.50	18.05	17.64
Mean, 7 a., 2 p., 9 p	11.90	13.77	16.00	17.87	18.50	18.17
Mean, 8 a	6.3	8.1	9.7	12.1	13.7	13.9
Mean, 8 p	15.0	17.0	18.7	20.1	19.9	18.9
Mean, 8 a., 8 p	10.65	12.55	14.20	16.10	16.80	16.40
Mean maximum	19.1	21.1	23.8	25.5	26.1	24.3
Mean minimum	5.6	6.9	8.8	10.9	12.3	12.7
Mean of max. and min	12.35	14.00	16.30	18.20	19.20	18.65
Maximum hourly	18.0	20.1	22.3	24.0	24.0	23.3
Minimum hourly	6.5	7.9	9.7	12.0	13.3	13.6
Mean, 7 a., 3 p., 11 p	11.60	13.40	15.43	17.37	18.03	17.80
Hourly amplitude	11.5	12.2	12.6	12.0	10.7	9.7
Total amplitude	13.5	14.2	15.0	14.6	13.8	11.6
Calculated:						
Mean, 24 hours	11.83	13.30	15.56	17.35	18.02	17.63
Mean maximum	18.98	20.69	23.52	25.84	26.22	24.85
Mean minimum	5.77	6.83	8.83	11.98	12.36	12.60

	July.	August.	September.	October.	November.	December.	Annual.
Mean, 24 hours	16.74	16.68	16.17	14.89	13.89	12.06	15.36
Mean, 7 a., 2 p., 9 p	17.20	17.13	16.60	15.13	14.13	12.37	15.73
Mean, 8 a	13.4	13.3	12.9	11.3	9.5	7.4	10.97
Mean, 8 p	17.3	17.6	17.4	16.9	16.0	14.5	17.44
Mean, 8 a., 8 p	15.35	15.45	15.15	14.10	12.75	10.95	14.20
Mean maximum	23.1	23.1	22.0	21.2	19.9	18.6	22.32
Mean minimum	12.2	12.3	12.1	10.2	8.2	6.2	9.87
Mean of max. and min	17.65	17.70	17.05	15.70	14.05	12.40	16.10
Maximum hourly	21.8	21.8	21.1	19.8	19.4	17.9	21.12
Minimum hourly	13.2	13.2	12.8	11.2	9.6	7.5	10.87
Mean, 7 a., 3 p., 11 p	16.90	16.73	16.33	14.83	13.80	11.93	15.35
Hourly amplitude	8.6	8.6	8.3	8.6	9.8	10.4	10.25
Total amplitude	10.9	10.8	9.9	11.0	11.7	12.4	12.45
Calculated:							
Mean, 24 hours	16.92	16.51	16.27	15.34	13.59	12.00	15.36
Mean maximum	23.21	22.37	22.04	21.34	20.08	18.95	22.34
Mean minimum	12.38	12.32	11.97	10.47	8.09	6.20	9.98

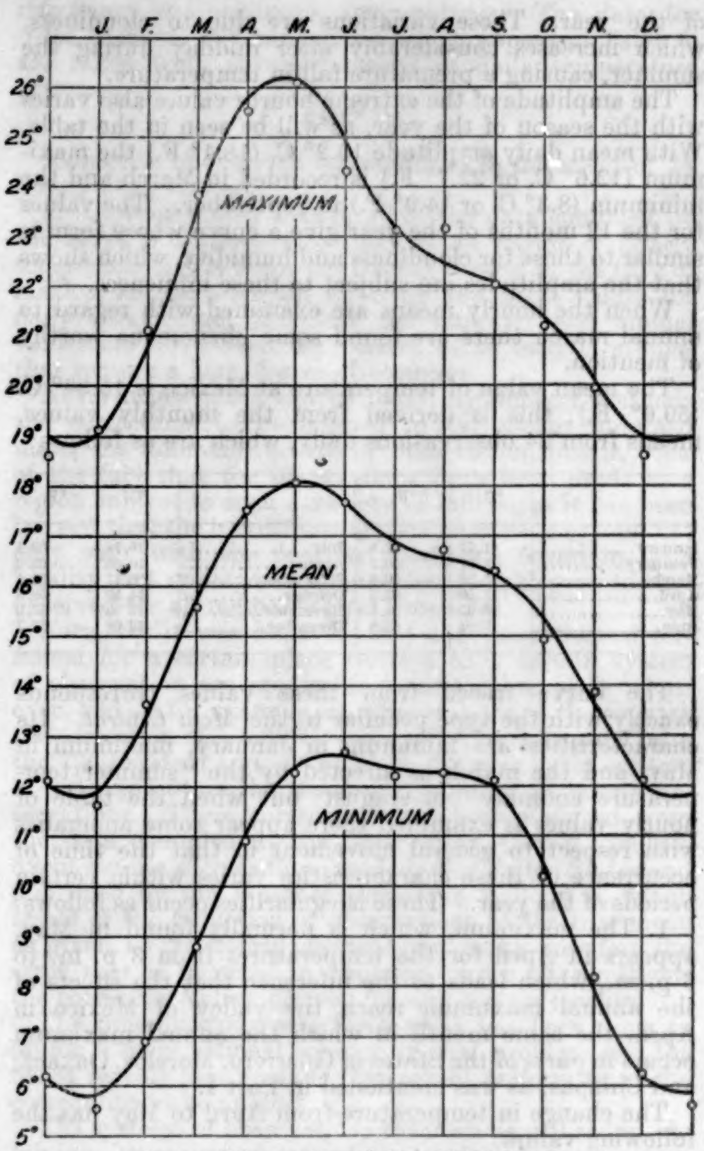


FIG. 35.—Difference observed *minus* calculated means.

In the mean annual curve the amplitude in hourly values is 10.2° C. (18.4° F.), with minimum temperature of 10.9° C. (51.6° F.) at 6 a. m. and maximum of 21.1° C. (70.0° F.) at 3 p. m. Consequently the ascending march takes place during the period of 9 hours, and the descending march in the period of 15 hours, there being a mean hourly change of 1.21° C. during the ascent and of 0.73° C. in the descent, which gives the ratio of 10:6.

These conditions vary with the season of the year, and the example given should be taken only as a generality since, as is well known, the mean annual variation of any meteorological element whatever does not actually occur on any date in the year.

As has been stated, the minimum temperature occurs about sunrise, due to the fact that the loss of heat through nocturnal radiation does not cease until the increased insolation on the new day is sufficiently great to compensate it. On examining the table of hourly temperatures it is seen that this minimum occurs at 5 a. m. from May to August, at 6 a. m. in March, April, September, October, November, and December, and at 7 a. m. in January and February, thus confirming the previous statement. The maximum is reached at 2 p. m. from May to September, and at 3 p. m. during the remainder

of the year. These variations are due to cloudiness, which increases considerably after midday during the summer, causing a premature fall in temperature.

The amplitude of the extreme hourly values also varies with the season of the year, as will be seen in the table. With mean daily amplitude 10.2° C. (18.4° F.) the maximum (12.6° C. or 22.7° F.) is recorded in March and the minimum (8.3° C. or 14.9° F.) in September. The values for the 12 months of the year give a curve whose form is similar to those for cloudiness and humidity, which shows that the amplitudes are subject to these influences.

When the hourly means are examined with regard to annual march there are found some phenomena worthy of mention.

The mean value of temperature at Mexico is 15.36° C. (59.6° F.); this is derived from the monthly values, means from 24 observations daily, which are as follows:

	°C.	°F.		°C.	°F.
January	11.57	52.8	July	16.74	62.1
February	13.61	56.5	August	16.68	62.0
March	15.56	60.0	September	16.17	61.1
April	17.50	63.5	October	14.89	58.8
May	18.05	64.5	November	13.89	57.0
June	17.64	63.8	December	12.06	53.7

The curve traced from these values corresponds exactly with the type peculiar to the *Mesa Central*. Its characteristics are minimum in January, maximum in May, and the march as affected by the "summer temperature anomaly" in August; but when the table of hourly values is examined there appear some anomalies with respect to general movement in that the time of occurrence of these characteristics varies within certain periods of the year. These irregularities occur as follows:

1. The maximum, which is normally found in May, appears in April for the temperatures from 3 p. m. to 6 p. m., which leads to the inference that the effects of the annual maximum reach the valley of Mexico in April, the same month in which the annual maximum occurs in parts of the States of Guerrero, Morelos, Oaxaca, and Chiapas, as was mentioned in Part I.

The change in temperature from April to May has the following values:

	1	2	3	4	5	6	7	8	9	10	11	12
A. m.	0.5	0.8	0.9	1.0	1.1	1.3	1.5	1.5	1.6	0.7	0.4	0.4
P. m.	0.1	0.1	−0.1	−0.3	−0.5	0.0	0.0	0.2	0.3	0.4	0.6	0.6

2. In general the temperature falls from May to June with a mean change of 0.41° C. (0.7° F.), but there is a rise, or at least no change, in the early hours of the day (1 a. m. to 8 a. m.), as is seen in the following:

	1	2	3	4	5	6	7	8	9	10	11	12
A. m.	0.0	0.0	0.0	0.2	0.3	0.3	0.3	0.0	−0.5	−0.7	−0.9	−1.3
P. m.	−1.0	−0.7	−0.7	−1.0	−0.9	−0.8	−0.5	−0.6	−0.6	−0.4	−0.3	−0.1

Since the month of May is less cloudy than June nocturnal radiation is naturally stronger in the first of these months, giving it greater diurnal temperature oscillation.

Theoretically, May should be colder than June, but it has been seen that cloudiness plays such an important rôle in the phenomenon observed that observation is contrary to that theory. At the hours of the day near the occurrence of the minimum the temperatures do not fall so much in June as in May, and at the hours near the maximum they do not rise so high in the later month.

3. The anomaly that is observed in the march of the meteorological elements in the months of July and August over almost all of the country, and has been called here the "summer temperature anomaly," is reflected very noticeably in the subject that is now under discussion. The temperature is higher in August than in July for the hours from 4 p. m. to 8 p. m., and the hourly temperatures are the same in both months at 1 a. m., 2 a. m., 4 a. m., 5 a. m., 2 p. m., 9 p. m., 10 p. m., and 11 p. m., so that the phenomenon is generally found from 2 p. m. until 5 a. m., or during a period of 15 hours. As has been stated elsewhere rainy weather and noticeable fall in temperature occur in July as the result of the marked barometric gradient prevailing over the Gulf of Mexico. With diminished gradient in August there is a certain return to normalcy in the meteorological phenomena, and relative to temperature there is observed a stationary condition or even a rise, as is noted in the present case of the City of Mexico. The hourly temperature change from July to August has the following values, which give an annual mean of −0.06° C. (−0.1° F.):

	1	2	3	4	5	6	7	8	9	10	11	12
A. m.	0.0	0.0	−0.1	0.0	0.0	−0.2	−0.2	−0.2	−0.4	−0.4	−0.5	−0.6
P. m.	−0.1	0.0	−0.3	0.1	0.7	0.5	0.3	0.2	0.0	0.0	0.0	−0.1

4. In Mexico the annual minimum for monthly values occurs in December or in January, each case related to a large zone of territory. In the City of Mexico the monthly minimum occurs in January, the change in temperature from the preceding month being −0.49° C. (0.9° F.). However, as in the case of the maximum, there are hours for which the minimum occurs in the month of December, as appears in the following:

	1	2	3	4	5	6	7	8	9	10	11	12
A. m.	−0.6	−0.7	−0.7	−0.8	−0.9	−1.0	−1.1	−1.2	−1.1	−0.9	−0.7	−0.5
P. m.	−0.4	−0.3	0.1	0.1	0.4	0.6	0.3	0.1	0.0	0.1	0.0	−0.2

The change of sign in the variations occurs between 3 p. m. and 11 p. m. The cause of this phenomenon, as in the case of the maximum, is the influence of cloudiness, which is more marked in December than in January, especially in the afternoon and evening.

In Figure 34 are found curves showing annual temperature variation for the City of Mexico; they are based on the values in Table 6 and have the following notations:

Mean monthly maxima.
Mean at 8 p. m. 75th meridian time.
Mean of monthly maxima and minima.
Mean for observations at 7 a. m., 2 p. m., and 9 p. m.
Mean for 24-hourly observations.
Mean for observations at 8 a. m. and 8 p. m., 75th meridan time.
Mean for observations at 8 a. m., 75th meridian time.
Mean monthly minima.

In general the annual temperature march in the City of Mexico presents the characteristics noted elsewhere, namely, maximum in May, minimum in January, and interruption of harmonic march in the summer. These characteristics are observed not only in the curve for the system with 24 hourly observations, but also in those for the systems of 7, 2, 9; 7, 3, 11; 8, 8; and max., min.

The mean temperature for the City of Mexico has as its annual value 15.36° C. (59.6° F.), with mean annual maximum of 22.32° C. (72.2° F.) and mean annual minimum of 9.87° C. (49.8° F.), giving a mean annual oscillation of 12.45° C. (22.4° F.). The month with highest temperature, May, has a mean of 18.05° C. (64.5° F.); and that with lowest temperature, January, a mean of 11.57° C. (52.8° F.); the monthly amplitude is 6.48° C. (11.7° F.).

The mean minimum, and with it the mean temperatures for the early morning hours, show a uniform rise from January to May, afterwards a slow fall until September with a variation of only −0.6° C. in the minimum for all of the latter period. After September the temperature fall for minimum values is more rapid until the annual march is completed. It is to be noted that the "summer temperature anomaly" is reduced for the minimum and hourly temperatures near the hour of minimum to a brief anomaly in July, the continuity of the curve being reestablished in the following month as has been shown by analytical calculation. The mean minimum has an annual value of 9.87° C. (49.8° F.) with extremes of 12.7° C. (54.9° F.) and 5.6° C. (42.1° F.) in June and January, respectively, and hence an amplitude of 7.1° C. (12.8° F.). The variation from month to month is given as follows:

	°C.		°C.
January	−0.6	July	−0.5
February	1.3	August	0.1
March	1.9	September	−0.2
April	2.1	October	−1.9
May	1.4	November	−2.0
June	0.4	December	−2.0

The mean maximum temperature, on the contrary, varies in a more irregular manner, so also the mean temperatures for the afternoon hours when the influence of cloudiness and humidity is greatest. The maximum registers its lowest value in December, rises rapidly until May, and then falls until the close of the year, exception being made, of course, of the marked discontinuity caused by the "summer temperature anomaly." The month to month changes in the maximum are the following:

	°C.		°C.
January	0.5	July	−1.2
February	1.0	August	0.0
March	2.7	September	−1.1
April	1.7	October	−0.8
May	0.6	November	−1.3
June	−1.8	December	−1.3

In all of the region of the Gulf slope the influence of the "summer temperature anomaly" gives a marked rise in maximum temperature in August relative to the preceding month. In Chignahuapan the change amounts to 2.5° C. (4.5° F.), which is sufficient to give August the maximum for the year. This rise in temperature is more marked at the stations in the northeastern section of the country, where, as has been noted in Part I, the mean temperature is higher in August than in July, and it is to be presumed that mean maximum for August would show this in a more noticeable manner in that region.

In speaking of the differences that exist in the annual variations in temperature for the hours of the day four cases have been pointed out. It can be seen that the march of the temperature maximum is subject to the influences mentioned under Case 1, and that of temperature minimum to those under Case 4.

The City of Mexico is the only point in the country for which there is available a series of observations of maximum and minimum temperatures. The data for these elements in temperature, which appear in Table 6, are taken from monthly means of daily temperature extremes.

PART III.

Reduction of observed temperatures to the mean of 24 hourly observations.

It has been stated that in all of the data compiled by the *Servicio Meteorologico* there is no record of hourly temperatures except for the *Oficina Central* in the City of Mexico, so there remain unknown the exact values for daily means, and therefore the monthly and annual values are not sufficiently correct to be used in studies that require a high degree of accuracy.

Nevertheless there can be found by indirect methods the corrections to be applied to the means obtained under the different systems of observation, but in view of the fact that the observations have been made in a region subject to such a variety of influences it has been learned that the corrections applicable in each system not only vary with the peculiar conditions found in each locality, but undergo an annual change analogous to that observed for all meteorological elements.

Formerly it was believed that the corrections determined for a certain place relative to a certain system of observation are applicable to any other place whatever, and so, for example, at some stations of the country the correction of −0.38°C. was applied to the means from the 7,2,9 system and +0.81°C. to the max., min. system in order to obtain the theoretical mean of 24 hourly observations. These corrections had been deduced from the data compiled at the *Observatorio Central*. Subsequent studies such as those made in the United States and published by the Weather Bureau in Bulletin S, which treats of the reduction of observations to the true mean as given by 24 hourly observations, make manifest the error that is incurred in applying under all conditions the correction values derived for any certain locality.

The present study sets forth what has been done to obtain a more rational solution of that problem and the result reveals how great is the lack of uniformity in the corrections to be applied.

The systems of observations that can be utilized in obtaining, by means of corrections, a close approximation to 24 hourly observations are the following:

Observations: $\frac{7+2+9}{3}$ (local time)

Observations: $\frac{8+8}{2}$ (75th meridian time)

Observations: $\frac{\text{max.}+\text{min.}}{2}$

Observations: 8 a. m.

The first system is that generally accepted by the *Servicio Meteorologico Oficial* as a substitute for that of 24 hourly observations, in lieu of the more complete systems used in other countries such as $6+12+6+12\div4$, $4+8+12+4+8+12\div6$, and so on up to the mean of 24 hours.

No study is made here of the max. + min. ÷ 2 formula on account of the lack of observations except for the City of Mexico and on account of the insufficiency of those.

In some other countries, especially in those of Central and South America there are in use a variety of systems of observation whose means are accepted as daily means. This lack of uniformity in the method of observation prevents a scientific comparison of the results obtained. Among those systems, all based on local time, there are

found the following $6+6 \div 2$, $9+9 \div 2$, $6+1+8 \div 3$, $6+1+9 \div 3$, $7+1+9 \div 3$, $7+2+9+9 \div 4$, etc.

These systems were inaugurated without any consideration of a rational division of the day for the work of observation—that is, without reasonable uniformity in the interval such as was adopted at the inauguration of the system of observations in the United States, namely, $7+3+11 \div 3$. In some of these methods a uniform interval exists between the observations, but the continuity is broken on passing to the following day, as for example in that of $6+1+8 \div 3$ and $7+2+9 \div 3$ (used in Mexico) which has between the hours of observation an interval of 7 hours, but between the last observation of one day and the first of the next day 10 hours elapse, thus breaking the continuity of the progression. In the United States there was finally adopted after several years experience the system $7+3+11 \div 3$, in which there is a constant interval of 8 hours between the observations, hence a rational system.

It would be advantageous from every point of view if this system of observation were inaugurated in Mexico. In the course of the work relative to this matter its efficiency has been appreciated, the conviction has been formed that its corrections for reduction to the mean of 24-hourly observations are better distributed over the teritory. Aside from the question of advantage this is true for other reasons, among them the matter of uniformity, in the methods of observation in the different countries of the world.

The correction to be applied to the mean of the observations from the 7, 3, 11 system in order to reduce to the mean of 24-hourly observations has for an annual value the very small amount of 0.01° C. with extremes of +0.21° C. in February and −0.16° C. in June, July, and September, the annual amplitude being 0.37° C. In the United States the maximum values of correction for this system of observation are found at Denver as follows: Annual, +0.33° C.; extremes, +0.72° C. and −0.05° C.; amplitude, 0.77° C. On the other hand, the system 7, 2, 9 requires corrections of very nearly 2° C. in some regions of Mexico.

Bulletin S of the U. S. Weather Bureau at Washington, D. C., entitled "Report on the temperatures and vapor tensions of the United States," by Prof. Frank H. Bigelow, gives an exhaustive discussion of the problem whose solution is attempted here, and presents the results obtained in the United States relative to the systems of observation as follows: 7, 3, 11; 8, 8; 8 a. m.; and max., min. Charts were drawn giving the values of the corrections necessary to reduce to the mean of 24 hourly observations. In the United States there existed no difficulty in executing the study; in the Annual Report of the Chief of the Weather Bureau for the years 1891 to 1901 there are given, for 25 stations well distributed over the territory of the United States, the temperature values for the 24 hours of each day for this entire period of 11 years. Hence there are available for those places the daily means from 24 hourly observations, and no difficulty enters into the calculation of the corrections. The distribution of the stations was advantageous and permitted the tracing of charts, from which corrections were derived by interpolation for the remaining stations.

In undertaking this work it appeared that some discrepancies exist, at least at some of the stations of the United States near the Mexican border, and it was determined to investigate the causes. It was noted that the most southern of the selected stations, to which reference has been made, are San Diego, Santa Fe, and Galveston, and that all of the remaining stations south of the line ideally uniting those places have uncertain corrections if the courses of the curves across our country are certain, a fact which could not be presumed in the United States.

In the correction charts for the systems 8, 8, and 8 a. m., which are in common use in the two countries, we find, as a rule, the region of greatest correction near the center of the United States between Dodge City and Denver. Santa Fe, situated to the southwest of those stations, has smaller correction values, and Galveston, to the southeast, still smaller ones. Bigelow naturally thought it the most logical course to close the curves across the Mexican frontier, giving them a west-east orientation, but the fact is, as will be seen later, that the curves follow in a general manner the configurations of the coasts. The presence of the two gulfs causes the curves to take that position, but they should not be closed. In this way the center of maximum correction is extended over a large part of northern Mexico, values being found equal to or even greater than those for Dodge City and Denver.

It has just been stated that the systems of observation 8, 8 and 8 a. m. are common to the two countries; hence by taking the charts of corrections necessary to reduce these systems to that of 24 hourly observations so complete for the United States as given in Bulletin S and the corrections for the Antilles also appearing in that bulletin together with the data for the City of Mexico we can prolong the curves of equal correction into the territory of Mexico, deducing by means of these the numerical values of correction for each of the stations.

Nevertheless for the purpose of giving orderly form to our analysis and of obtaining greater certainty in the final results the work was begun by constructing the tables Nos. 7 and 8 from the values of these differences (8, 8)−8 a. m. and (7, 2, 9)−(8, 8).

Since the system 7, 2, 9 is that one of the three systems whose values most nearly approximate the values of means obtained from 24 hourly observations the curves (7, 2, 9)−(8, 8) should have in general a form similar to that for the curves (24 hours)−(8, 8), and meanwhile the curves resulting from the values (8, 8)−8 a. m. should be of value for comparison.

TABLE 7.—*Reduction of temperatures to the 24-hour system. Differences (8a., 8p.)−8a.* (°C.)

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Ahualulco	5.2	5.7	6.3	6.7	4.9	3.5	3.1	2.9	2.9	3.5	4.6	4.7	4.4
Autlan	3.7	3.3	3.3	3.1	2.9	2.6	2.2	1.9	1.8	2.2	3.2	2.6	2.8
C. Guzman	4.6	4.7	4.6	4.4	3.8	2.2	1.9	2.1	2.3	2.8	3.5	4.0	3.4
C. Juarez	4.1	4.5	4.5	4.6	4.9	4.3	3.9	3.6	3.7	4.5	4.1	3.4	4.2
C. Victoria	3.1	3.4	3.9	3.7	3.5	3.2	2.3	3.0	2.8	2.1	2.3	2.4	3.0
Colima	4.0	4.1	4.6	4.4	3.3	2.1	1.9	1.9	2.0	2.5	3.3	3.4	3.2
Colotlan	5.9	6.1	6.3	6.1	5.5	4.3	3.5	3.2	3.7	4.8	5.2	5.9	5.1
Comitan	2.1	1.8	2.2	2.3	2.0	1.7	1.7	1.5	1.4	1.5	1.8	1.9	1.9
Cuernavaca	3.0	3.6	4.1	4.3	3.2	2.6	2.4	2.2	2.1	2.4	2.7	2.3	2.9
Culiacan	4.7	4.9	5.3	5.3	4.5	3.5	2.7	2.2	2.6	3.4	3.9	4.3	3.9
Chignahuapan	2.7	2.9	3.1	2.7	2.0	1.8	1.7	1.9	1.8	1.5	1.8	2.2	2.1
Chihuahua	4.7	5.6	5.3	5.5	6.7	4.3	3.5	3.4	3.6	5.0	4.4	4.8	4.7
Durango	4.6	5.5	5.6	5.4	5.0	4.2	3.3	2.9	2.9	4.3	5.0	4.9	4.4
Fuerte	7.3	7.5	7.1	7.4	7.0	5.4	3.4	3.2	3.3	5.3	6.1	6.4	5.8
Guadalajara	4.7	5.4	5.5	5.4	5.1	3.6	3.0	2.7	2.7	3.5	4.1	4.4	4.2
Guanajuato	4.1	4.7	4.7	4.7	4.0	3.5	3.2	3.0	3.3	3.4	3.5	3.6	3.8
Guaymas	2.0	2.1	2.4	2.8	2.8	2.4	2.0	1.6	1.5	1.9	1.8	1.6	2.1
Hermosillo	4.0	4.5	5.2	5.7	5.7	5.0	3.7	3.5	3.4	4.1	3.8	3.4	4.3
Huejutla	1.2	1.1	1.5	1.7	1.4	1.5	1.1	1.0	1.2	1.1	0.9	1.2	1.3
Isla Mujeres	0.4	0.5	0.5	0.6	0.3	0.3	0.2	0.2	0.2	0.2	0.5	0.5	0.4
Izamal	3.4	3.7	4.0	3.6	2.7	1.3	1.4	1.4	1.5	1.7	2.3	2.7	2.4
Jalapa	1.2	1.3	1.2	1.0	0.8	0.8	0.8	0.9	0.7	0.9	0.9	1.2	1.0
La Barca	4.9	5.3	5.3	5.1	4.8	3.1	2.6	2.6	2.9	3.4	4.0	4.7	4.1
Lagos	5.2	5.6	6.1	6.1	6.0	4.6	4.1	4.0	3.9	4.1	4.2	5.0	4.9
Lampazos	2.9	3.1	3.3	3.1	3.9	3.5	3.6	4.0	3.5	3.3	2.6	3.1	3.3
Leon	5.3	5.7	6.0	6.0	5.7	4.0	3.3	3.3	3.5	4.1	4.5	4.6	4.6
Manzanillo	1.2	1.3	1.3	1.4	1.3	1.2	1.2	1.6	1.2	1.2	1.3	1.3	1.3
Mascota	3.9	4.2	4.0	3.8	3.3	2.8	2.1	1.9	1.7	2.0	2.9	3.5	3.0
Maxcanu	3.2	3.5	3.6	3.5	3.0	1.8	2.0	2.1	1.9	2.1	2.6	2.8	2.7
Mazatlan	1.4	1.4	1.6	1.6	1.3	1.0	1.2	1.3	1.4	1.6	1.5	1.3	1.4

TABLE 7.—*Reduction of temperatures to the 24-hour system. Differences (8a., 8p.)–8a. (°C.)*—Continued.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Merida	2.3	2.4	2.7	2.3	1.8	1.1	1.1	1.1	1.2	1.3	1.8	2.0	1.8
Mexico	4.3	4.5	4.5	4.0	3.1	2.5	2.0	2.1	2.3	2.8	3.2	3.6	3.2
Monterrey	3.1	3.6	3.7	3.7	4.9	4.1	3.8	4.0	3.1	2.6	2.4	3.0	3.5
Morelia, Obs	4.8	5.0	4.8	4.6	3.7	2.5	2.2	2.0	2.0	2.6	3.2	3.7	3.5
Morelia, Sem	5.4	5.6	5.3	4.8	4.0	3.0	2.7	2.5	2.5	3.4	4.0	4.8	4.0
Oaxaca	4.7	5.4	5.4	4.3	2.7	2.1	2.6	2.6	2.5	2.7	3.5	4.6	3.6
Ojinaga	4.9	5.2	6.3	6.1	5.8	5.1	3.7	3.4	3.6	4.8	5.0	4.1	4.8
Pachuca	2.5	2.8	2.6	2.3	1.8	1.5	1.5	1.3	1.6	1.9	2.1	2.2	2.0
Parral	5.5	5.4	5.3	5.5	6.5	4.3	3.6	3.4	3.4	4.3	5.0	5.9	4.8
Peto	3.6	3.9	4.2	3.8	2.8	1.5	1.7	1.5	1.7	2.2	2.5	2.9	2.7
Piedras Negras	3.8	4.3	4.6	4.6	4.3	4.6	3.5	4.3	3.9	4.1	3.5	3.9	4.2
Pochutla	3.4	3.4	3.3	2.8	2.1	2.2	2.4	1.9	2.0	2.2	3.0	3.2	2.7
Progreso	1.6	1.7	1.7	1.4	1.0	0.6	0.6	0.8	1.0	0.9	1.2	1.5	1.1
Puebla	4.2	5.0	4.9	3.8	2.9	2.3	2.0	2.2	2.4	2.7	4.5	4.3	3.4
Queretaro	4.8	4.9	5.4	5.0	4.2	3.5	3.2	3.2	3.2	2.4	4.0	4.3	4.0
Rio Bravo	1.9	2.0	2.9	2.8	2.9	2.6	2.4	2.4	2.6	3.1	2.5	2.6	2.5
Salina Cruz	1.2	1.4	1.9	2.0	1.5	1.5	1.9	2.0	1.8	1.4	1.3	1.4	1.6
Saltillo	2.4	3.0	3.2	3.1	3.4	3.7	3.5	3.4	3.0	2.5	2.3	2.3	3.0
S Cristobal	3.4	4.2	4.1	3.5	2.8	1.7	1.7	1.7	1.3	1.5	2.2	2.6	2.6
S. Juan Bautista	0.9	0.9	1.0	1.0	0.8	0.9	1.0	0.8	0.8	0.7	0.4	0.6	0.8
S Luis Potosi	2.2	2.8	3.0	3.2	2.8	2.7	1.6	2.1	2.1	2.2	2.2	2.3	2.5
Sierra Mojada	2.6	3.4	3.5	3.7	3.8	4.6	2.6	2.6	2.3	2.5	2.2	1.7	3.0
Silacayoapan	4.8	4.8	4.6	4.2	3.1	2.4	2.4	2.7	2.8	3.4	3.9	3.7	3.6
Tapachula	2.7	2.9	3.0	2.5	1.3	1.2	1.5	1.4	1.1	1.4	2.1	2.6	2.0
Tampico	1.1	0.7	0.8	0.9	0.8	0.4	0.7	0.9	0.9	1.0	1.1	0.8	0.8
Teocaltiche	6.3	6.6	6.8	6.5	6.0	4.8	3.5	3.5	3.7	4.7	6.1	6.4	5.4
Tepic	2.8	3.2	3.2	2.7	2.5	2.4	2.2	2.0	2.0	2.3	2.8	3.0	2.8
Tlaxcala	4.5	4.7	4.7	3.5	3.0	2.2	2.0	2.3	2.7	2.8	3.2	3.9	3.3
Toluca	4.5	4.8	4.4	3.7	2.9	2.3	1.8	2.1	1.9	2.5	3.5	3.9	3.2
Torreon	5.0	5.2	5.4	5.7	4.9	4.4	3.9	4.0	3.7	4.8	4.4	4.6	4.6
Tuxtepec	1.9	2.1	2.6	2.7	2.4	1.9	2.1	1.8	1.5	0.9	0.7	1.3	1.9
Tuxtla Gutierrez	2.5	3.0	3.1	2.5	2.1	1.7	1.8	1.8	1.9	1.6	1.7	2.1	2.1
Ulua (Vera Cruz)	1.3	1.1	1.2	1.1	0.8	1.2	1.4	1.7	1.6	1.5	1.3	1.3	1.2
Valladolid	2.4	2.5	2.3	2.0	1.3	0.6	0.4	0.5	0.8	1.4	1.7	1.9	1.5
Valle de Bravo	4.2	4.4	4.5	4.4	3.6	2.4	2.3	2.1	2.1	2.6	3.2	3.6	3.3
Vigia Chico	0.9	0.9	0.7	0.7	1.0	1.2	0.8	0.5	0.6	1.1	1.1	1.1	0.8
Xkalak	0.5	0.5	0.6	0.5	0.3	0.5	0.5	0.4	0.5	0.6	0.6	0.5	0.5
Zacatecas, Inst.	3.3	3.7	3.9	4.0	3.8	3.5	2.7	2.7	2.6	2.9	3.3	3.4	3.3
Zacatecas, Bufa	2.3	2.4	3.3	3.7	3.6	3.0	2.8	2.7	2.7	2.9	2.7	2.4	2.8
Zacualtipan	1.7	1.6	1.9	1.7	1.5	1.5	1.4	1.5	1.4	1.5	1.3	1.2	1.6

TABLE 8.—*Reduction of temperatures to the 24-hour system. Differences (7, 2, 9)–(8, 8). (°C.)*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Ahualulco	1.2	1.2	1.3	1.0	1.0	0.5	0.6	0.7	0.9	0.8	0.6	1.0	0.9
Autlán	2.4	2.2	1.9	2.3	2.2	1.7	1.6	1.4	1.6	1.7	2.4	2.5	2.0
C. Guzmán	1.8	1.8	2.4	2.9	2.4	1.6	1.5	1.4	1.8	1.9	1.1	1.5	1.8
C. Juárez	1.3	1.6	1.5	1.2	1.5	1.6	2.2	1.8	0.9	0.5	0.6	0.8	1.3
C. Victoria	1.7	1.6	1.5	1.4	1.4	1.3	1.5	1.8	1.8	1.2	1.0	1.0	1.4
Colima	1.5	1.8	2.1	2.2	2.5	1.6	1.2	1.4	1.5	1.8	2.1	1.6	1.8
Colotlán	1.3	2.2	2.1	1.9	1.6	1.3	1.5	1.7	2.0	1.6	1.4	1.2	1.6
Comitán	1.9	2.4	1.9	1.4	2.2	2.0	1.4	1.6	1.7	1.0	0.6	1.1	1.6
Cuernavaca	1.0	0.7	0.8	1.1	0.7	0.4	0.5	0.5	0.6	1.1	1.5	1.3	0.8
Culiacan	1.5	1.3	1.7	1.8	1.4	1.3	0.9	1.8	0.9	1.2	1.6	1.3	1.3
Chignahuapan	1.6	1.9	2.0	2.3	2.2	2.0	2.1	2.2	2.0	1.9	2.1	2.2	2.1
Chihuahua	0.9	0.6	0.5	0.5	0.6	0.7	0.4	0.5	0.5	0.7	0.8	1.0	0.6
Durango	1.5	1.2	1.6	1.4	1.5	1.8	1.8	1.8	1.7	2.0	1.9	1.9	1.7
Fuerte	1.8	1.4	1.9	1.8	1.8	1.2	0.9	0.7	0.9	0.8	0.7	1.3	1.3
Guadalajara	0.6	0.8	1.1	1.1	0.8	0.6	0.7	0.8	1.1	1.2	1.0	0.9	0.8
Guanajuato	2.1	1.8	2.2	2.4	2.0	1.9	1.6	1.8	1.8	2.1	2.2	2.1	2.0
Guaymas	1.7	0.3	0.5	0.6	1.0	1.2	1.0	1.0	0.7	1.2	1.3	0.4	0.9
Hermosillo	1.1	−0.6	−0.6	−0.4	−0.4	0.6	0.1	0.3	0.5	1.2	1.9	1.0	0.4
Huejutla	0.6	0.3	0.7	1.2	1.3	1.3	1.1	1.0	0.7	0.5	0.5	0.8	0.8
Isla Mujeres	0.1	−0.1	0.1	0.0	0.2	0.2	0.1	0.0	0.1	−0.1	0.0	0.0	0.1
Izamal	2.4	2.3	2.3	2.4	2.1	2.3	1.8	1.7	1.9	2.5	2.4	2.4	2.2
Jalapa	1.0	0.8	1.0	1.4	1.0	0.6	0.6	0.6	0.7	0.7	0.8	1.0	0.8
La Barca	1.6	1.4	1.7	2.2	2.1	1.8	1.4	1.6	1.9	2.0	1.5	1.5	1.7
Lagos	1.2	1.5	1.9	1.8	1.4	1.6	2.0	2.2	2.2	1.7	1.0	1.1	1.6
Lampazos	0.7	0.6	0.5	0.0	−0.6	−0.3	0.4	0.6	0.6	0.0	0.2	0.5	0.3
Leon	1.4	1.3	1.7	1.7	1.1	1.2	1.2	1.5	1.5	1.8	2.0	1.7	1.6
Manzanillo	...	...	...	...	...	...	...	...	...	...	...	...	...
Mascota	1.2	1.0	1.2	1.0	0.8	0.6	0.6	0.2	0.4	0.8	1.0	1.7	0.9
Maxcanú	1.8	1.8	1.7	1.8	1.9	1.8	1.6	1.6	1.3	1.5	1.3	1.7	1.7
Mazatlán	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.3	0.2	0.4	0.2	0.4
Mérida	1.8	1.5	1.3	1.7	1.6	1.4	1.2	1.3	1.3	1.6	1.5	1.5	1.4
México	1.3	1.2	1.8	1.8	1.7	1.8	1.8	1.7	1.4	1.0	1.3	1.4	1.5
Monterrey	1.0	0.9	1.1	1.0	0.7	1.0	1.0	1.3	1.3	1.1	0.6	0.2	1.0
Morelia, Obs	1.4	1.2	1.3	1.6	1.4	0.9	1.0	1.4	1.2	1.5	1.6	1.5	1.3
Morelia, Sem	1.4	1.3	1.7	1.8	1.8	1.3	1.1	1.0	0.9	1.3	1.2	1.1	1.3
Oaxaca	2.0	2.2	2.4	2.4	1.8	1.5	1.6	1.8	1.8	2.0	2.2	2.5	2.0
Ojinaga	3.4	3.0	2.8	3.0	3.2	1.7	1.1	1.1	2.0	2.9	3.3	3.5	2.6
Pachuca	2.8	3.3	3.8	3.5	2.3	1.8	1.6	1.6	1.8	2.1	2.1	2.7	2.4
Parral	1.8	2.2	1.7	1.4	1.0	1.5	1.6	1.8	1.6	2.0	2.0	1.2	1.6
Peto	2.5	2.2	2.2	2.5	2.3	2.2	1.9	1.5	1.5	1.6	1.8	2.2	2.0

TABLE 8.—*Reduction of temperatures to the 24-hour system. Differences (7, 2, 9)–(8, 8). (°C.)*—Continued.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Piedras Negras	0.5	0.5	0.3	0.4	0.5	1.0	2.0	1.2	0.9	0.6	0.7	0.6	0.7
Pochutla	1.8	1.8	2.2	2.4	1.4	1.0	1.8	2.1	1.4	1.2	1.7	1.9	1.7
Progreso	1.1	1.0	1.0	1.0	0.8	0.8	0.9	0.5	0.5	0.6	0.6	0.9	0.8
Puebla	2.0	1.9	2.1	1.7	1.6	1.1	1.3	1.5	1.6	1.8	1.8	1.9	1.6
Querétaro	1.4	1.5	1.2	1.5	1.5	1.4	1.5	1.6	1.6	1.6	1.7	1.6	1.5
Rio Bravo	0.6	0.3	0.4	0.4	0.4	0.4	0.9	1.4	1.1	1.1	1.0	0.8	0.8
Salina Cruz	0.8	1.0	1.1	0.9	0.6	0.5	0.6	0.8	0.8	0.7	0.7	0.8	0.8
Saltillo	0.9	1.2	1.3	1.0	1.2	0.6	0.2	0.8	1.1	0.7	0.5	0.9	0.8
S. Cristobal	1.5	1.6	1.2	0.3	1.7	1.0	1.0	1.1	1.0	0.9	1.2	1.3	1.1
S. Juan Bautista	0.2	0.1	0.0	0.1	0.0	0.2	0.5	0.3	0.3	0.1	0.0	0.1	0.2
S. Luis Potosi	1.6	1.0	0.9	0.8	0.9	1.4	0.6	0.9	1.1	1.2	1.4	1.6	1.1
Sierra Mojada	0.8	0.9	0.6	0.8	1.0	0.6	0.7	0.6	0.6	0.6	0.2	0.6	0.6
Silacayoapan	2.5	2.9	3.0	3.1	2.5	1.7	2.0	2.0	2.3	2.4	2.6	2.9	2.5
Tapachula	2.2	2.1	1.9	1.3	0.9	0.9	1.1	1.6	1.7	1.0	1.3	1.9	1.5
Tampico	0.8	0.7	1.1	1.2	1.1	0.8	0.9	0.3	0.8	0.6	0.7	0.8	0.8
Teocaltiche	1.6	1.6	1.4	1.6	1.4	1.4	1.3	1.3	1.6	1.6	1.3	1.1	1.4
Tepic	0.6	0.8	1.2	0.7	0.6	0.9	1.2	1.2	1.4	1.3	1.2	1.2	1.0
Tlaxcala	1.9	2.1	2.5	2.4	2.1	1.6	1.5	1.8	2.1	2.1	2.2	2.0	2.0
Toluca	1.9	2.1	1.8	1.7	2.0	1.8	1.5	1.6	1.6	1.7	1.9	1.8	1.8
Torreón	0.2	0.3	0.4	0.4	0.6	0.3	0.4	0.8	0.7	0.3	0.2	0.1	0.4
Tuxtepec	1.2	1.0	1.2	1.0	1.1	0.7	0.6	0.7	0.9	1.0	1.2	0.9	0.9
Tuxtla Gutierrez	1.3	1.4	1.3	1.1	1.6	1.4	1.2	1.2	1.4	1.0	1.2	1.3	1.3
Ulúa	0.5	0.6	0.6	0.6	0.3	0.2	0.2	0.5	0.5	0.4	0.4	0.3	0.5
Valladolid	2.1	1.8	1.2	1.3	1.6	1.2	0.8	0.9	1.3	1.7	1.9	1.9	1.4
Valle de Bravo	1.2	1.6	1.4	0.9	0.5	0.5	0.7	0.7	0.9	1.0	0.9	0.9	0.9
Vigia Chico	0.3	0.4	0.2	0.2	0.3	0.6	0.9	0.9	1.0	0.6	0.4	0.3	0.6
Xkalak	0.9	1.0	1.1	1.0	1.2	1.1	1.1	1.2	1.5	1.6	1.3	1.1	1.2
Zacatecas, Inst	...	...	...	...	...	...	...	...	...	...	...	...	...
Zacatecas, Bufa	0.4	0.4	0.6	1.2	1.6	1.4	1.6	1.7	1.7	1.7	1.4	0.8	1.4
Zacualtipan	0.3	1.0	1.6	1.5	1.0	0.8	0.9	0.9	1.1	0.8	0.7	0.6	0.9

From these data it will be possible to chart the corrections for reducing the means of the 8, 8 system to the mean of 24 hourly observations, the charting that appears in Bulletin S being extended to Mexico and the Antilles from Habana to Willemstad, Curacao, and Port of Spain, Trinidad.

In the tracing of the curves for the values (24 hours) − (8, 8) there were taken into consideration in addition to the data above indicated the relations that exist within the corrections for the stations of San Diego, Santa Fe, Galveston, Habana, and Mexico themselves, charts of these relations being drawn for the purpose of obtaining the closest possible approximation in the final results.

As the difference between the remainders found when two quantities are subtracted separately from a third is equal to the difference between the quantities subtracted, if the quantities are designated A, B, and M, respectively, then we have

$$\triangle A - \triangle B = (B - A)$$

or

$$(M-A)-(M-B)=(B-A) \qquad (1)$$

If we then take A = observations 7, 2, 9
B = observations 8, 8
M = obsrvations 24 hours

there will be obtained:

$$[24-(8,8)]-[24-(7,2,9)]=(7,2,9)-(8,8)$$

and since in the curves of equal correction 24 − (8, 8) the value (M − B) is already known, as described in a previous paragraph, and from the data obtained directly from the temperature values and appearing in Table VII, the value (B − A) is also known it is easy to deduce the value of (M − A):

$$(M-A)=(M-B)+(B-A) \qquad (2)$$

and the equation gives the correction 24 − (7, 2, 9).

In the same manner by substituting for A the value A_1, observations at 8 a. m. we obtain:

$$(M-A_1)=(M-B)+(B-A_1) \qquad (3)$$

On tracing the charts reproduced as Figures 36–43, which give the values of the corrections to reduce the two systems 8, 8 and 8 a. m. to 24 hourly values it can be observed that the values of $\triangle$ B and $\triangle A_1$ when applied separately to their respective observations give for M values that are generally very nearly equal. However, when the first approximation had been made we repeated the calculation until it resulted that the hypothetical values for the mean of 24 hourly observations were similar on making application of the values $\triangle$ B and $\triangle A_1$.

Lastly, after the required approximation was obtained, we calculated the values of $\triangle$ A, which are the corrections to reduce the system 7, 9, 2 to that of 24 hourly observations. (Fig. 46.) Figure 44 presents the corrections required to reduce the 8, 8 system to the 7, 2, 9 system, and finally the corrections to reduce the 8 a. m. to the 8, 8 system are given in Figure 45.

The fact that the calculation was made first with the observations 8 a. m. and 8 p. m. and then with those of 8 a. m. alone gives the advantage of comparison.

For the purpose of comparison advantage was taken of the short distance between El Paso, Tex., and Ciudad Juarez, Chihuahua. It was noted that notwithstanding the fact that these stations are closely adjacent, there was much disagreement in the first approximation, but on investigating the case it was proven that although there exist differences between the temperature values for these two neighboring cities they are not sufficiently great to cause the marked discrepancies that were found.

The annual mean of the values $(A_1 - B)$ for Ciudad Juarez is 4.2° C. On the other hand, in the data found in Bulletin S the annual value at El Paso for (M – B) is 0.5° C. and that for $(M - A_1)$ is 3.3° C. (annual); hence on substituting these values in equation (3) we have 3.3° = 0.5° + 4.2°, an absurdity.

By deduction from Figure 40 we have for Ciudad Juarez (M – B) = 0.8° C., and taking as before $(A_1 - B)$ = 4.2° C. (Table 7), the result is $(M - A_1)$ = 0.8° + 4.2° = 5.0°, which is the value of $\triangle A_1$ adopted in the construction of the charts of final approximation.

It would be tedious to enumerate the various changes that the correction values undergo in annual variation; reference will be made here only to the most important features in the general distribution of the corrections.

As a rule, all of the corrections to the mean of 24-hourly observations present the common feature that the centers of greatest correction—except for some isolated causes that are effective in another manner—are situated toward the center of the continent, just where the diurnal and annual temperature variations are most irregular.

We must not lose sight of the fact that geographical or rather geothermal situations as well as exceptional topographical conditions have rather great influence relative to the distribution of the different areas of corrections, which latter show no such uniformity as is observed in the countries of the Temperate Zone, as, for example, in the United States. Besides, the proximity of the thermal equator has a very noticeable influence in the variations in the atmospheric elements which invades the territory of Mexico at a certain time of the year, being effective along the Pacific coast and even in the interior regions.

The general distribution of the different areas of correction, (7, 2, 9) – (8, 8), (24 h) – (8, 8), and (24 h) – 8 a. m., may be described as follows:

A center of maximum corrections in the region of Ojinaga and connected with the large center at Denver; two regions of minimum correction, one in the northwestern and the other in the northeastern region of the country; a small area with minimum corrections on the coasts of Sinaloa and Nayarit; region of maximum corrections in the *Mesa Central*; southern region with minimum corrections in Michoacan, Morelos, and Guerrero; region with small corrections along the Gulf of Mexico and in the Isthmus of Tehuantepec; and, lastly, a center with large corrections in the peninsula of Yucatan and on the Guatemalan frontier, where there is a decrease with approach to the sea.

There is uniformity in the corrections (7, 2, 9) – (8, 8); no large annual variation is found, and in some places the variation amounts to only a few tenths of a degree Centigrade. As in the values for (8, 8) – 8 a. m., there is noted a maximum in March and a minimum in August, but this relates to amplitude of annual variation. In some months of the year and in regions where the corrections are small there is a change in sign correcponding to the irregularities that are observed in Table 3. This occurs in the northeastern and northwestern regions and in the extreme eastern part of the peninsula of Yucatan.

The charts reproduced as Figures 36–43 and the corresponding numerical values that are given in Table 10 were got through the combination of the data in chart 2 of Weather Bulletin S, those relative to the Antilles appearing in the same volume, and the values deduced from observations in the City of Mexico (Table 9).

The use of records of observation for a large area in the development of meteorological studies, especially in the field of climatology, facilitates the work and is advantageous from other points of view. For the first time in the history of the climatology of America there are presented through this work studies that extend over half of the American Continent, some of the charts include the region between the parallels of 12° and 62° N., and between the meridians of 45° and 130°, 60°, and 115° W., respectively. They include a large part of Canada, the United States, Mexico, Cuba, Haiti, and the Dominican Republic, and the remainder of the Antilles, extending to the vicinity of Venezuela, as well as a large part of Central America, from which there are unfortunately no data worthy of being taken in to consideration.

TABLE 9.—*Reduction of temperatures to 24-hour mean based on hourly observations, Mexico City.*

[Figures without sign are positive.]

Months.	Corrections. (°C.)						
	8 a. m to mean 8, 8.	Mean 8, 8 to mean 7, 2, 9.	Mean 7, 2, 9 to 24 hour.	8 a. m. to 24 hour.	Mean 8, 8 to 24 hour.	Mean of maximum, minimum, to 24 hour.	Mean 7, 3, 11 to 24 hour.
January	4.35	1.25	–0.33	5.27	0.92	–0.78	–0.03
February	4.45	1.22	–0.16	5.51	1.06	–0.39	0.21
March	4.50	1.80	–0.44	5.86	1.36	–0.74	0.13
April	4.00	1.77	–0.37	5.40	1.40	–0.70	0.13
May	3.10	1.70	–0.45	4.35	1.25	–1.15	0.02
June	2.50	1.77	–0.53	3.74	1.24	–1.01	–0.16
July	1.95	1.85	–0.46	3.34	1.39	–0.91	–0.16
August	2.15	1.68	–0.45	3.38	1.23	–1.02	–0.05
September	2.25	1.45	–0.43	3.27	1.02	–0.88	–0.16
October	2.80	1.03	–0.24	3.59	0.79	–0.81	0.06
November	3.25	1.38	–0.24	4.39	1.14	–0.16	0.09
December	3.55	1.42	–0.31	4.66	1.11	–0.34	0.13
Annual	3.23	1.53	–0.37	4.39	1.16	–0.74	0.01

Fig. 36. Corrections to reduce 8+8 to 24-hour means, January.

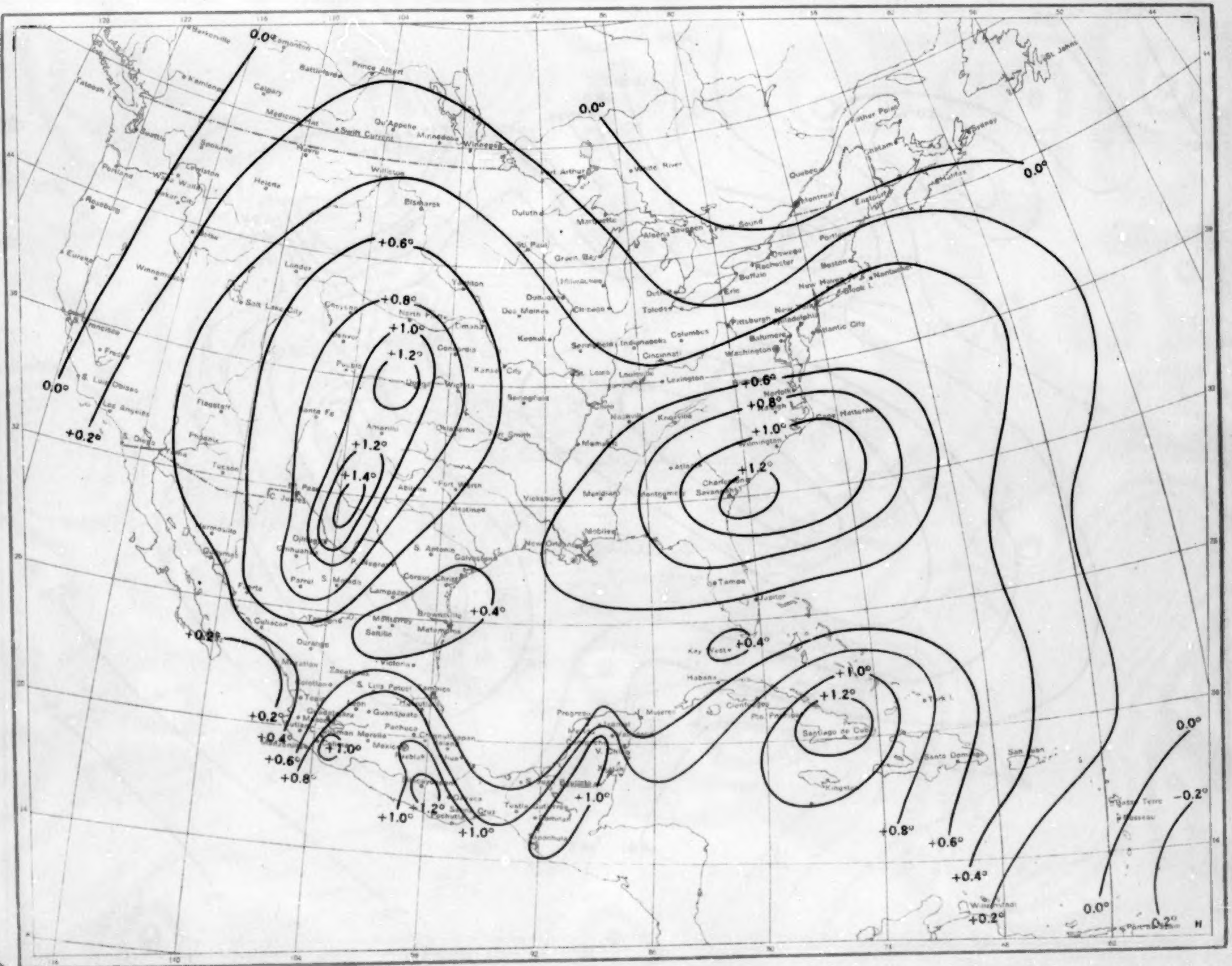


Fig. 37. Corrections to reduce 8+8 to 24-hour means, April.

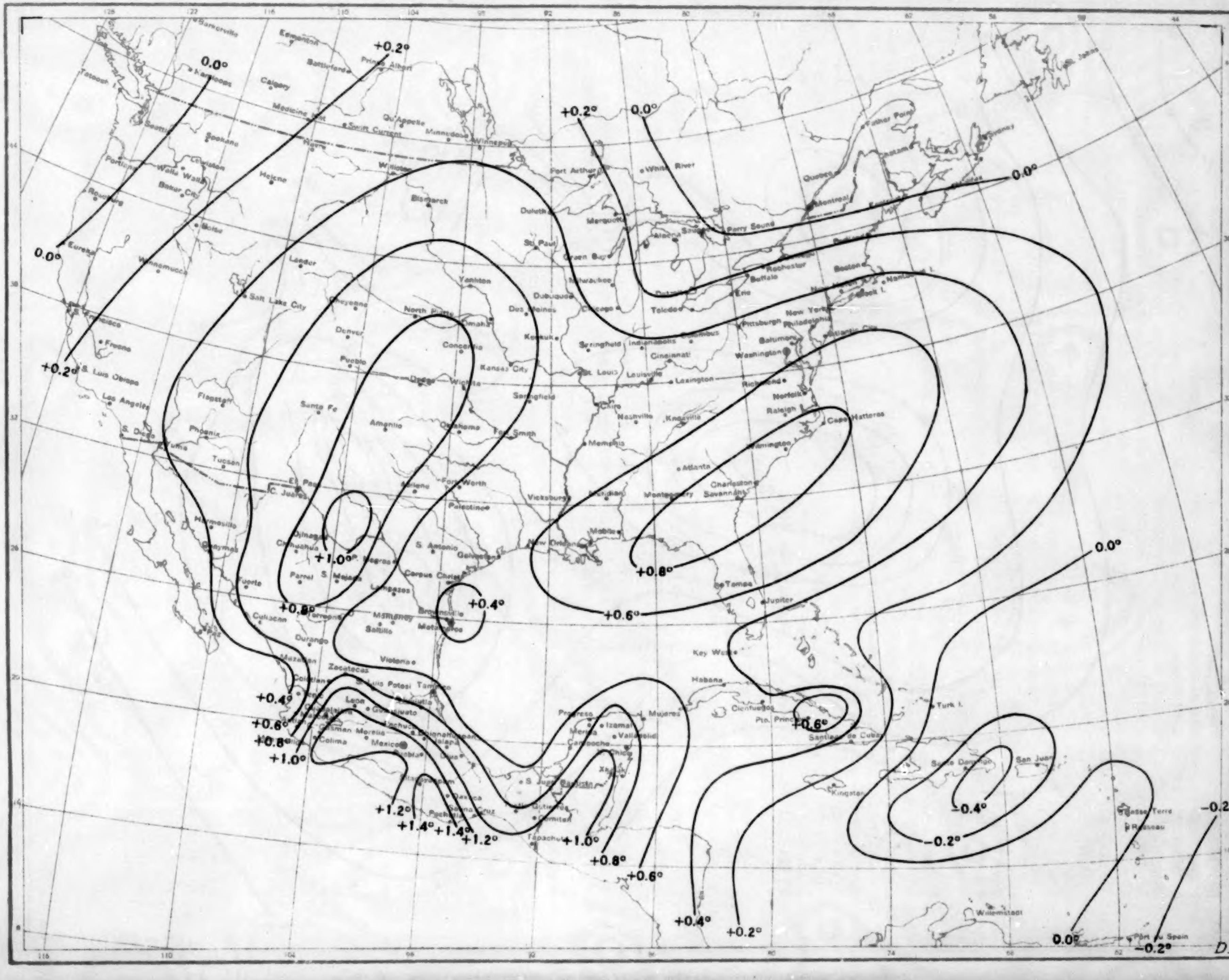


Fig. 38. Corrections to reduce 8+8 to 24-hour means, July.

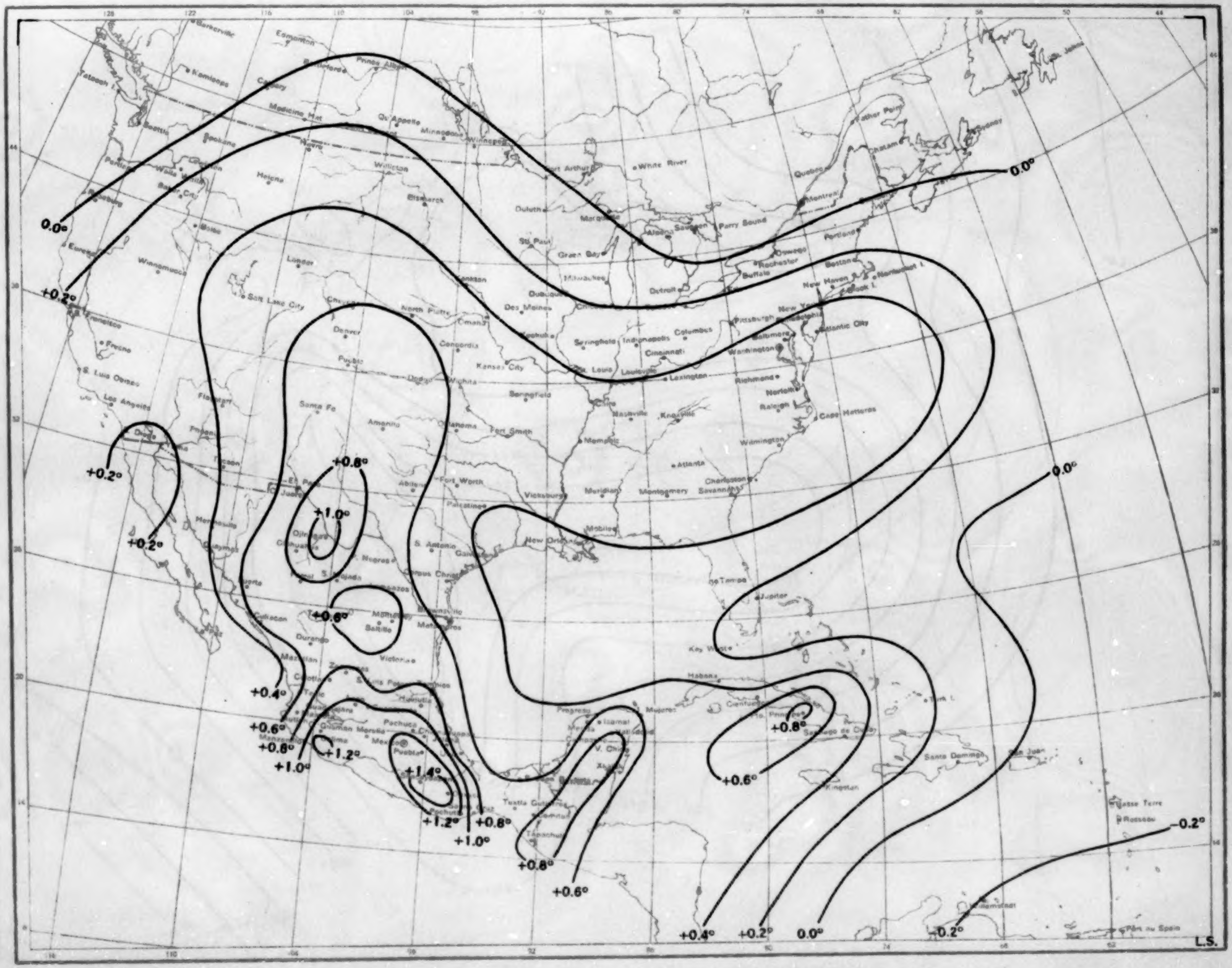


Fig. 39. Corrections to reduce 8+8 to 24-hour means, October.

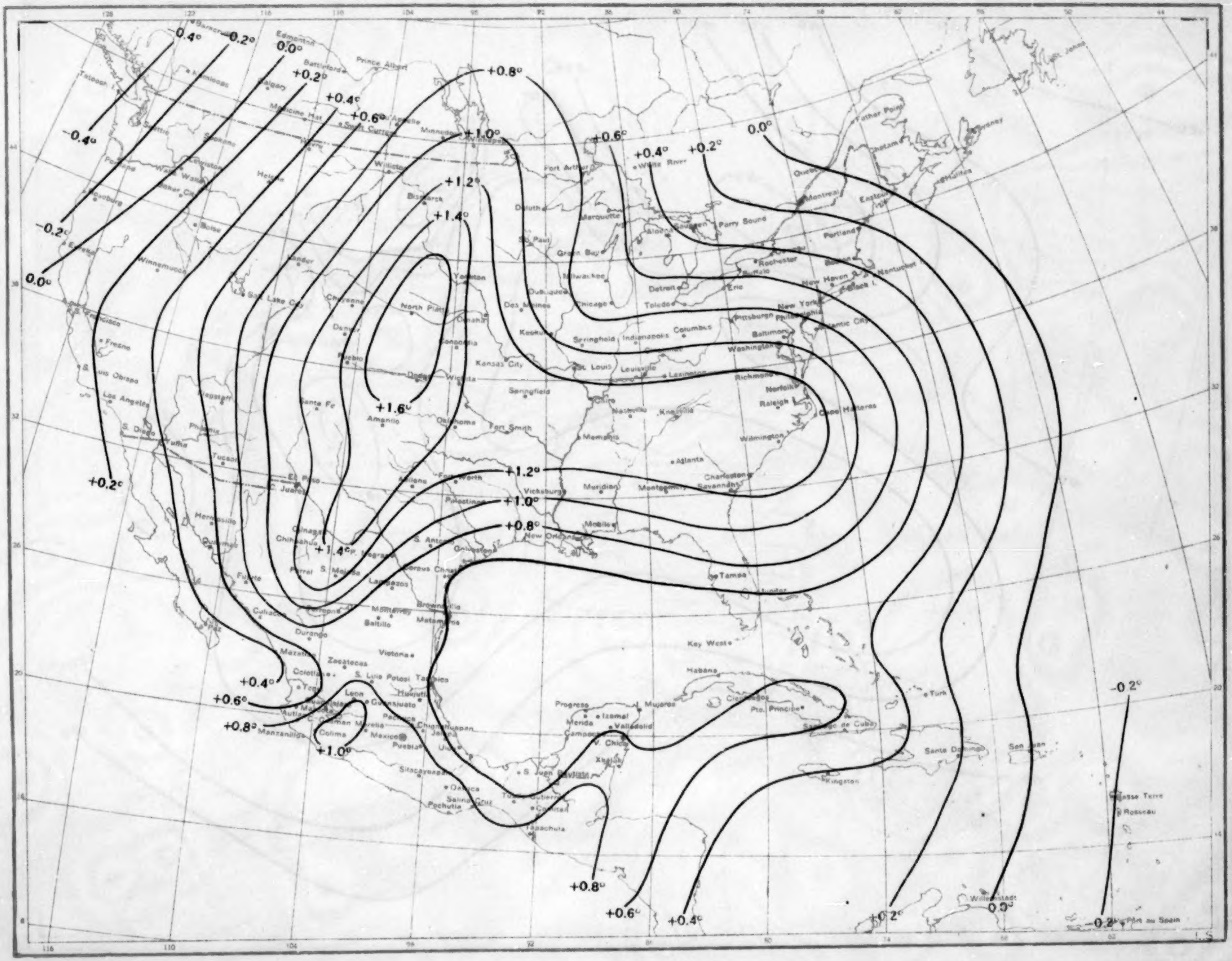


Fig. 40. Corrections to reduce 8+8 to 24-hour means, Year.

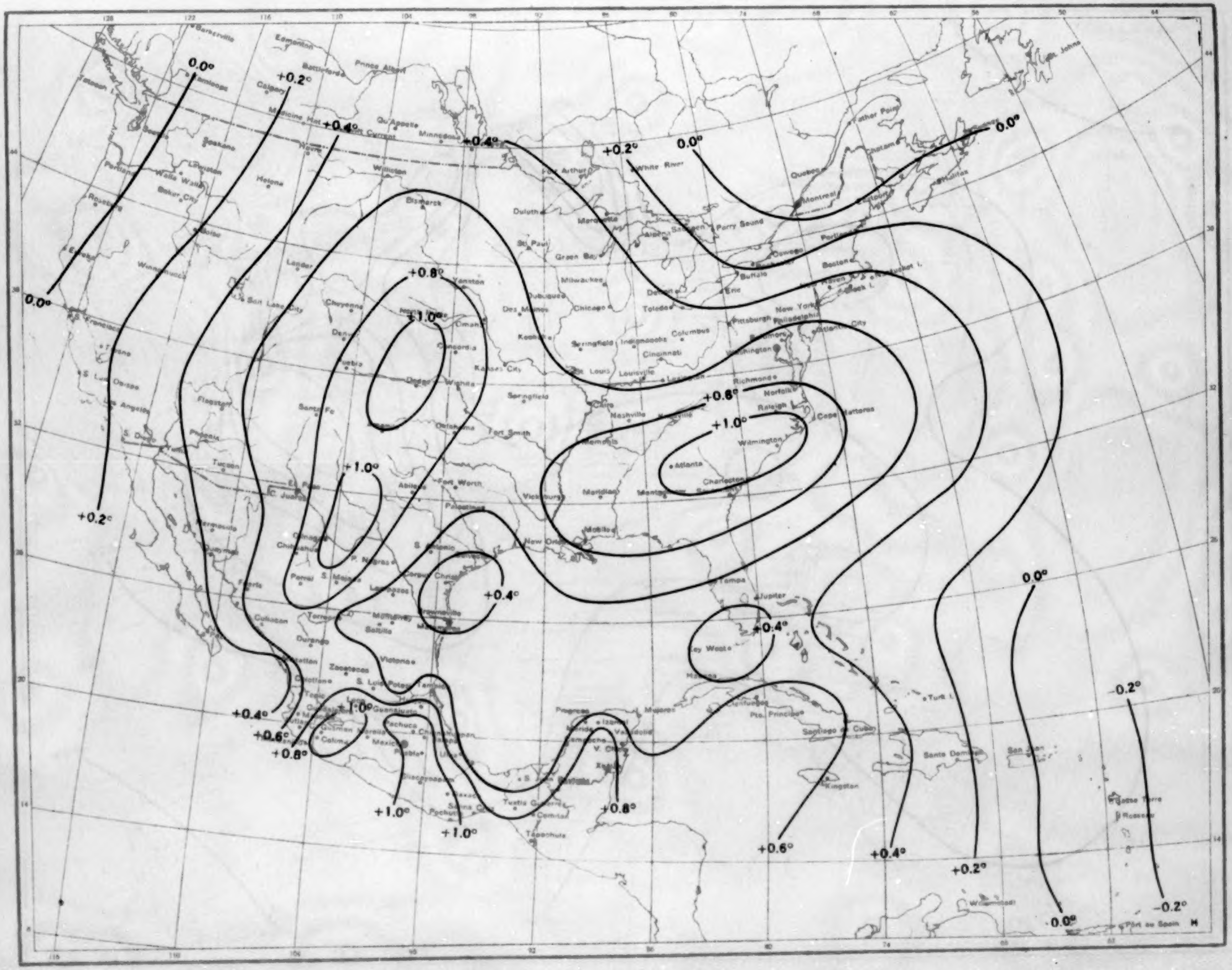
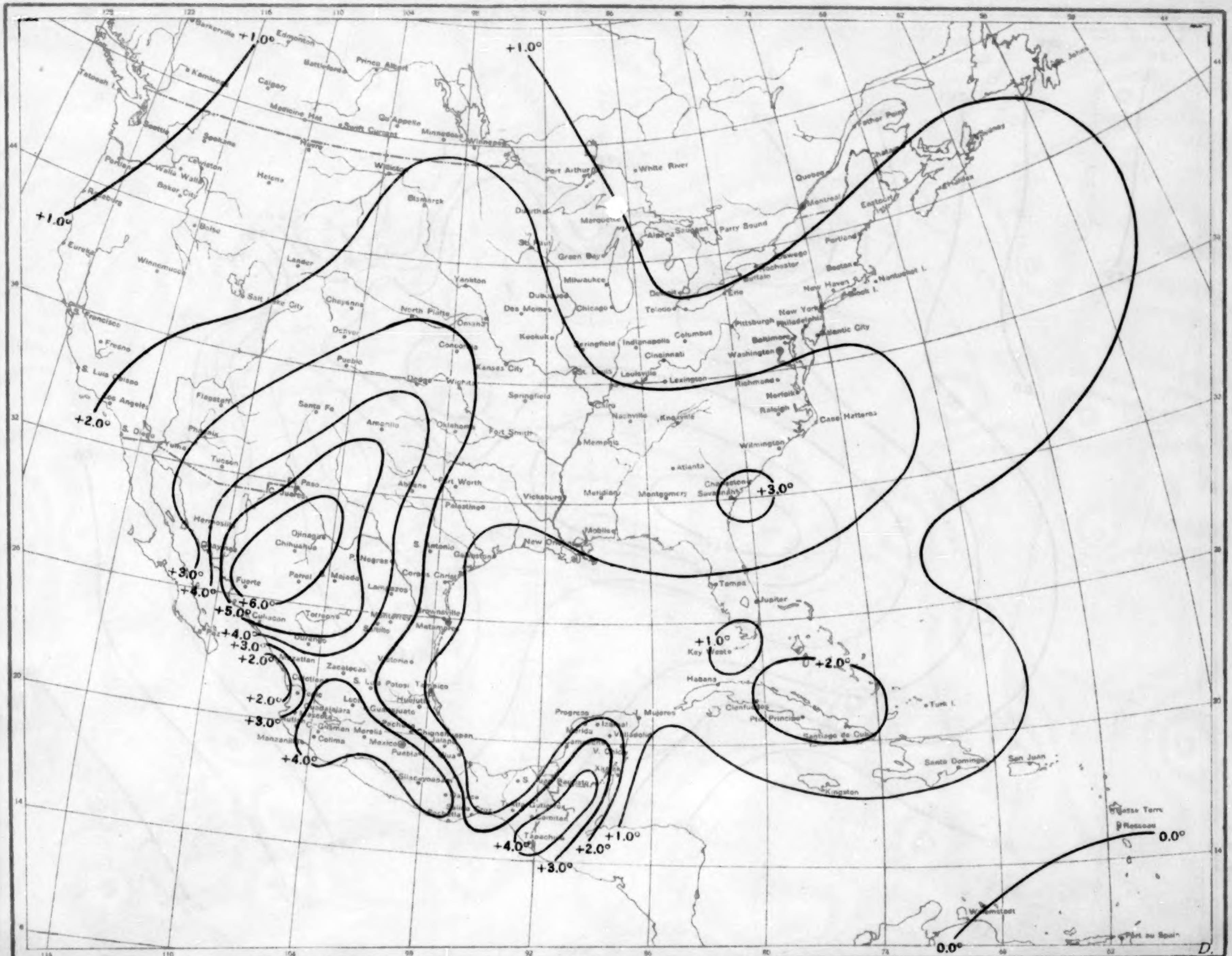


Fig. 41. Corrections to reduce 8 a. m. to mean of 24 hours, January.



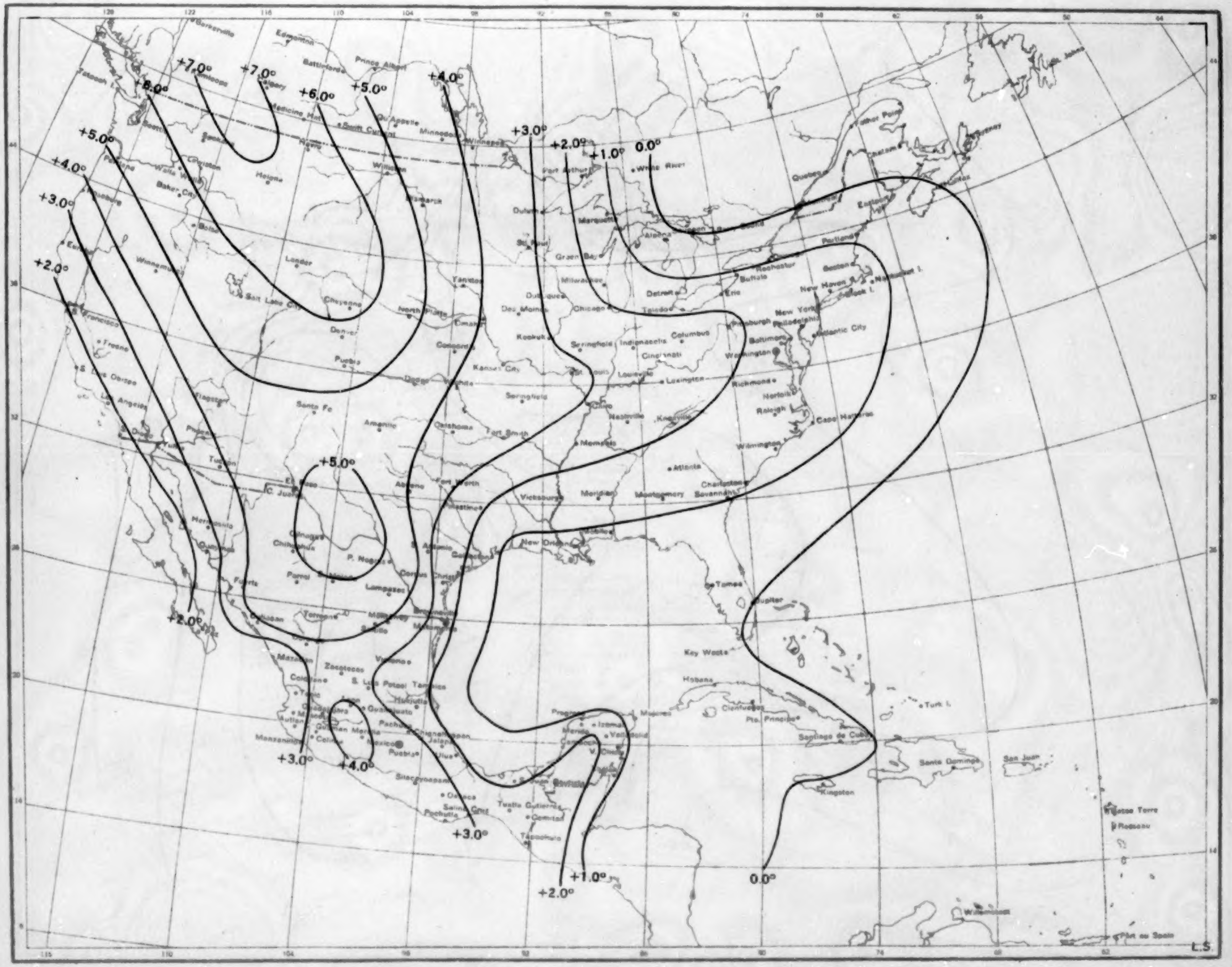


Fig. 42. Corrections to reduce 8 a. m. to mean of 24 hours, July.

Fig. 43. Corrections to reduce 8 a. m. to mean of 24 hours, Year.

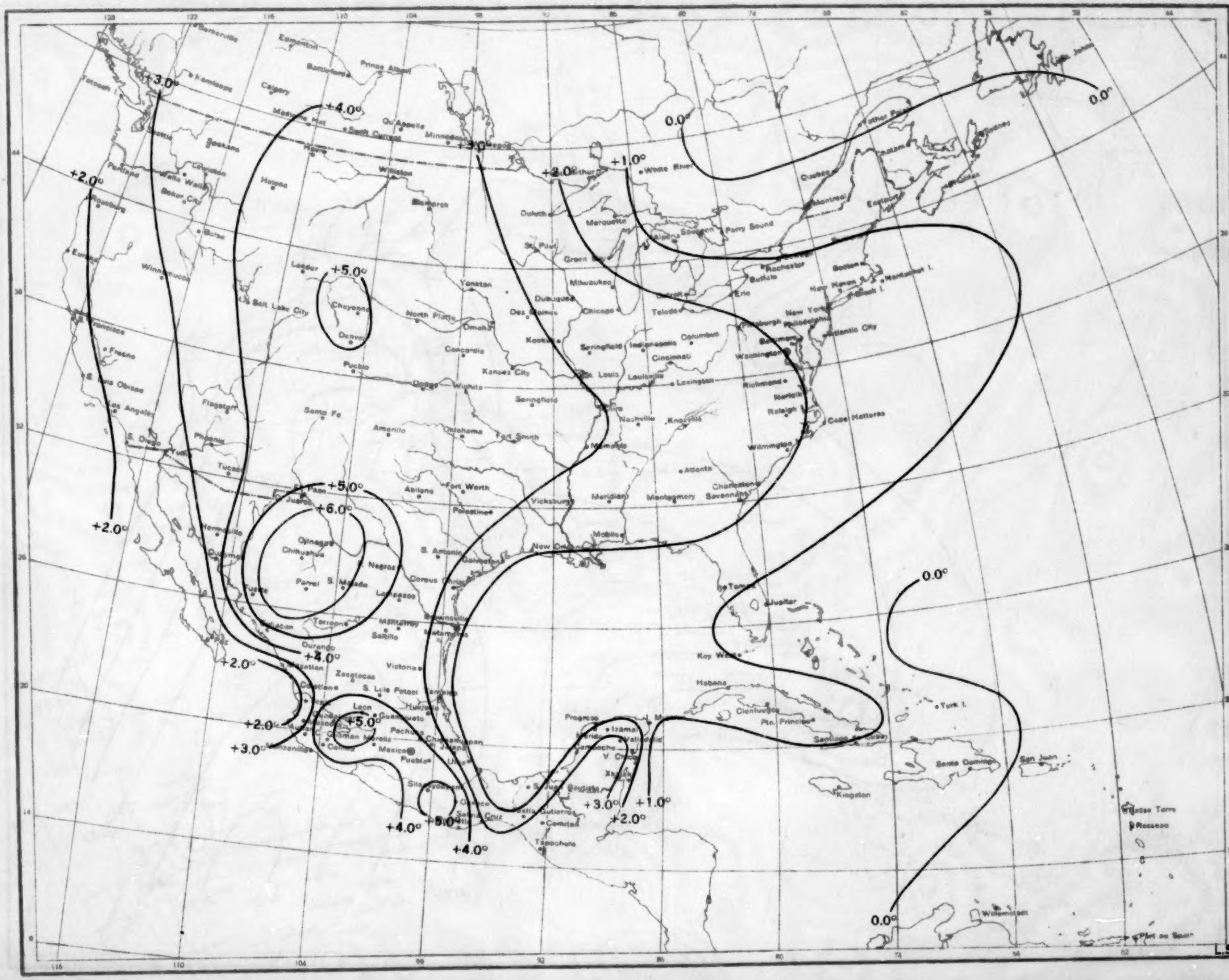


Fig. 44. Corrections to reduce 8+8 to 7+2+9 system, Year.

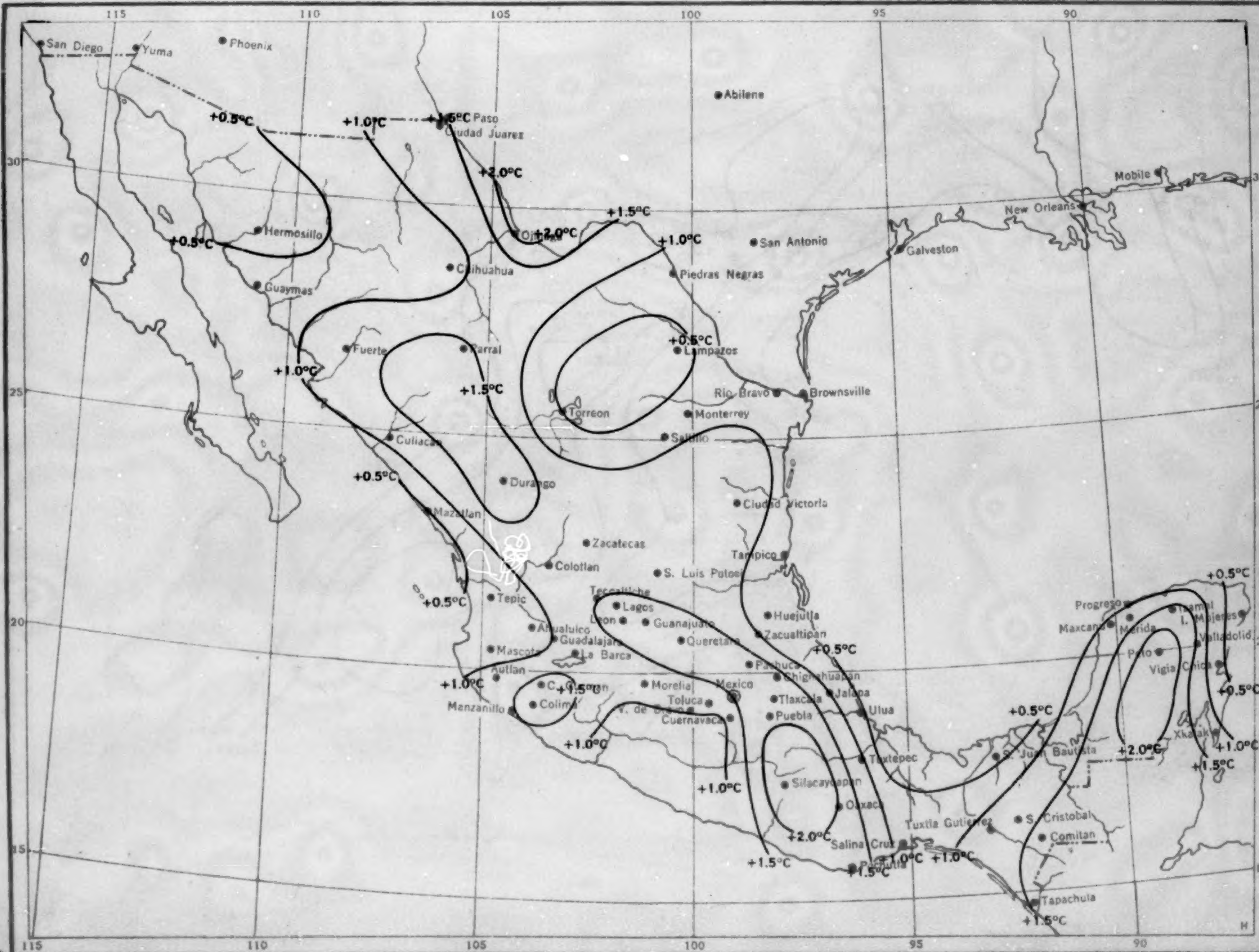


Fig. 45. Corrections to reduce 8a to 8+8 system, Year.

Fig. 46. Corrections to reduce 7+2+9 to 24-hour system, Year.

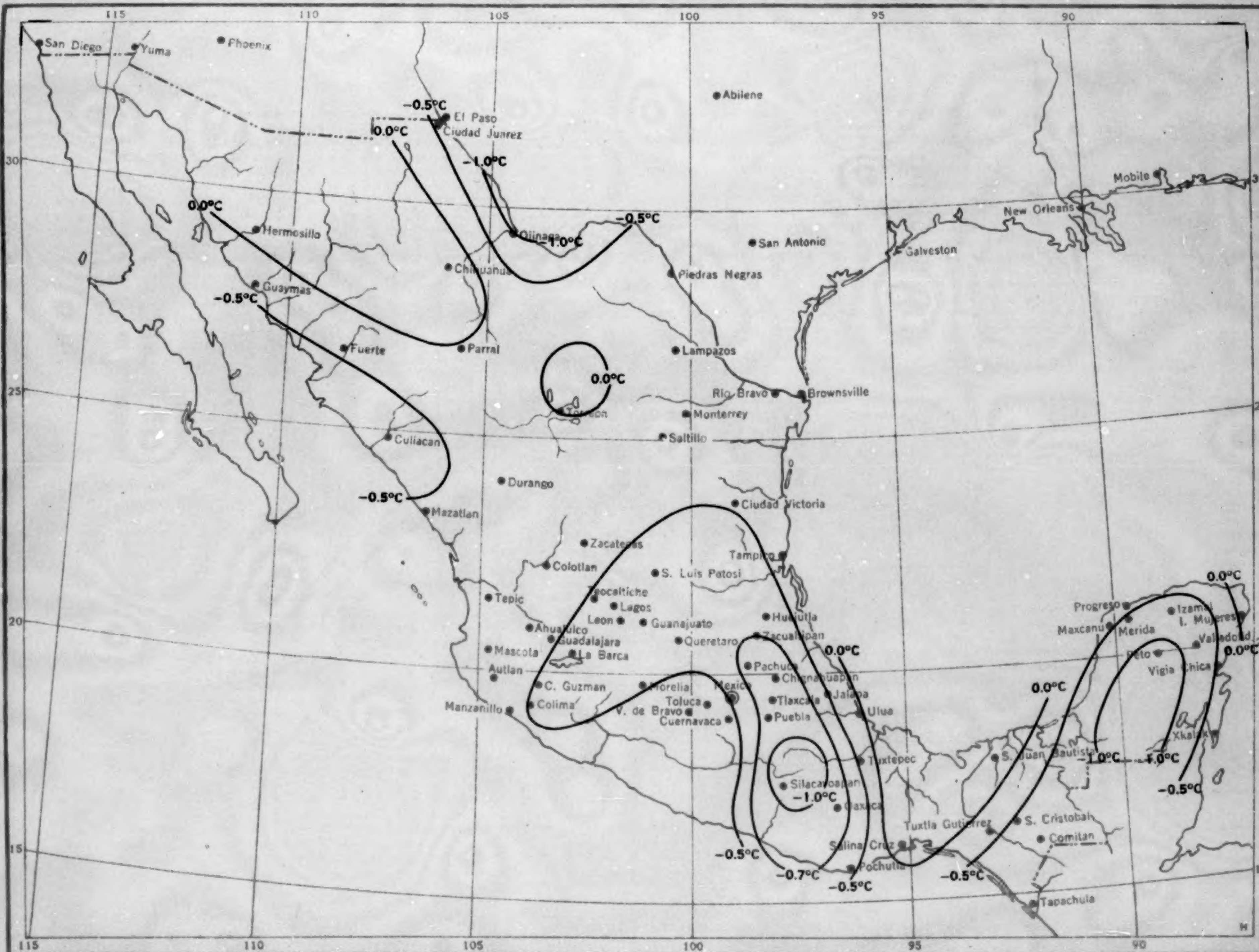


TABLE 10.—*Corrections to reduce temperatures of the hours named to the 24-hour mean.* (°*C.*)

[Figures without sign are positive.]

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Ahualulco:													
7, 2, 9	−0.6	−0.6	−0.5	−0.1	−0.2	0.2	0.2	0.1	−0.2	−0.2	−0.1	−0.3	−0.3
8, 8	0.6	0.6	0.8	0.9	0.8	0.7	0.8	0.8	0.7	0.6	0.7	0.7	0.7
8 a. m.	5.8	6.3	7.1	7.6	5.7	4.2	3.9	3.7	3.6	4.1	5.3	5.4	5.1
Autlan:													
7, 2, 9	−1.2	−1.0	−0.4	−0.8	−0.8	−0.4	−0.2	−0.1	−0.4	−0.8	−1.1	−1.1	−0.7
8, 8	1.2	1.2	1.5	1.5	1.4	1.3	1.4	1.3	1.2	0.9	1.3	1.4	1.3
8 a. m.	4.9	4.5	4.8	4.6	4.3	3.9	3.6	3.2	3.0	3.1	4.5	5.0	4.1
Guzman:													
7, 2, 9	−0.7	−0.7	−1.1	−1.5	−1.1	−0.3	−0.2	−0.2	−0.8	−1.1	−0.1	−0.4	−0.6
8, 8	1.1	1.1	1.3	1.4	1.3	1.3	1.3	1.2	1.0	0.8	1.0	1.1	1.2
8 a. m.	5.7	5.8	5.9	5.8	5.1	3.5	3.2	3.3	3.3	3.6	4.5	5.1	4.5
Juarez:													
7, 2, 9	−0.7	−1.0	−0.9	−0.5	−0.8	−1.1	−1.5	−1.0	0.0	0.5	0.6	0.2	−0.4
8, 8	0.6	0.6	0.6	0.7	0.7	0.5	0.7	0.8	0.9	1.0	1.2	1.0	0.8
8 a. m.	4.7	5.1	5.1	5.3	5.6	4.8	4.6	4.4	4.6	5.5	5.3	4.4	5.0
Victoria:													
7, 2, 9	−1.1	−1.0	−0.7	−0.7	−0.8	−0.8	−1.0	−1.1	−1.0	−0.3	−0.1	−0.2	−0.7
8, 8	0.6	0.6	0.8	0.7	0.6	0.5	0.5	0.7	0.8	0.9	0.9	0.8	0.7
8 a. m.	3.7	4.0	4.5	4.4	4.3	3.7	3.0	3.7	3.6	3.0	2.1	3.2	3.7
Colima:													
7, 2, 9	−0.4	−0.7	−0.8	−0.8	−1.2	−0.3	−0.1	−0.3	−0.4	−0.9	−0.9	−0.4	−0.6
8, 8	1.1	1.1	1.3	1.4	1.3	1.3	1.3	1.3	1.1	1.1	1.2	1.2	1.2
8 a. m.	5.1	5.2	5.9	5.8	4.6	3.4	3.2	3.2	3.1	3.6	4.5	4.6	4.4
Colotlan:													
7, 2, 9	−0.4	−1.0	−0.4	−0.3	−0.6	−0.5	−0.5	−0.7	−0.5	−0.4	−0.6	−0.4	−0.6
8, 8	0.7	1.2	1.7	1.6	1.0	0.8	0.6	1.0	1.5	1.2	0.8	0.8	1.1
8 a. m.	6.6	7.3	8.0	7.7	6.5	5.1	4.1	4.2	5.2	6.0	6.0	6.7	6.2
Comitan:													
7, 2, 9	−0.7	−1.3	−0.6	0.0	−1.1	−0.9	−0.3	−0.3	−0.6	−0.6	−0.5	−0.1	−0.4
8, 8	1.2	1.1	1.3	1.4	1.1	1.1	1.1	1.3	1.1	1.0	1.1	1.2	1.2
8 a. m.	3.3	2.9	3.5	3.7	3.1	2.8	2.8	2.8	2.5	2.5	2.9	3.1	3.1
Cueranavaca:													
7, 2, 9	−0.2	0.0	0.2	0.0	0.3	0.5	0.5	0.2	0.3	−0.5	−0.7	−0.4	−0.1
8, 8	0.8	0.7	1.0	1.1	1.0	0.9	1.0	0.8	0.9	0.6	0.8	0.9	0.9
8 a. m.	3.8	4.3	5.1	5.4	4.2	3.5	3.4	3.0	3.0	3.0	3.5	3.1	3.8
Culiacan:													
7, 2, 9	−1.0	−0.9	−1.3	−1.1	−0.8	−0.8	−0.3	−0.2	−0.2	−0.5	−0.8	−0.6	−0.7
8, 8	0.5	0.5	0.6	0.7	0.6	0.5	0.6	0.6	0.7	0.7	0.8	0.7	0.6
8 a. m.	5.2	5.4	5.9	5.7	5.1	4.0	3.3	2.8	3.3	4.1	4.7	5.0	4.5
Chignahuapan:													
7, 2, 9	−0.6	−0.9	−0.6	−0.9	−1.0	−0.8	−0.8	−1.0	−1.0	−1.1	−1.1	−1.1	−0.9
8, 8	1.0	1.0	1.4	1.4	1.2	1.2	1.3	1.2	1.0	0.8	1.0	1.1	1.1
8 a. m.	3.7	3.9	4.5	4.1	3.2	3.0	3.0	3.1	2.8	2.3	2.8	3.3	3.2
Chihuahua:													
7, 2, 9	0.0	0.2	0.3	0.4	0.3	0.1	0.4	0.5	0.6	0.5	0.4	0.2	0.4
8, 8	0.9	0.8	0.8	0.9	0.9	0.8	0.8	1.0	1.1	1.2	1.2	1.2	1.0
8 a. m.	5.6	5.4	6.1	6.4	7.6	5.1	4.3	4.4	4.7	6.2	5.6	6.0	5.7
Durango:													
7, 2, 9	−0.6	−0.4	−0.7	−0.4	−0.6	−0.7	−1.0	−0.8	−0.7	−0.8	−0.7	−0.8	−0.7
8, 8	0.9	0.8	0.9	1.0	0.9	0.8	0.8	1.0	1.0	1.2	1.2	1.1	1.0
8 a. m.	5.5	6.4	6.5	6.4	5.9	5.0	4.1	3.9	3.9	5.5	6.2	6.0	5.4
Fuerte:													
7, 2, 9	−1.2	−0.8	−1.5	−1.0	−1.1	−0.6	−0.2	0.0	0.1	0.1	0.3	−0.5	−0.5
8, 8	0.6	0.6	0.6	0.8	0.7	0.6	0.7	0.7	1.0	0.9	1.0	0.8	0.8
8 a. m.	7.9	8.1	7.6	8.2	7.7	6.0	4.1	3.9	4.3	6.2	7.1	7.2	6.6
Guadalajara:													
7, 2, 9	0.0	−0.2	−0.3	−0.2	0.0	0.1	0.1	0.0	−0.4	−0.6	−0.3	−0.2	−0.1
8, 8	0.6	0.6	0.8	0.9	0.8	0.7	0.8	0.8	0.7	0.6	0.7	0.7	0.7
8 a. m.	5.3	6.0	6.3	6.3	5.9	4.3	3.8	3.5	3.4	4.1	4.8	5.1	4.9
Guanajuato:													
7, 2, 9	−0.8	−0.6	−0.6	−0.8	−1.0	−0.8	−0.5	−0.4	−0.4	−0.4	−0.7	−0.6	−0.7
8, 8	1.3	1.2	1.6	1.6	1.0	1.1	1.1	1.4	1.4	1.7	1.5	1.5	1.3
8 a. m.	5.4	5.9	6.3	6.3	5.0	4.6	4.3	4.4	4.7	5.1	5.0	5.1	5.1
Guaymas:													
7, 2, 9	−1.4	0.0	−0.1	−0.2	−0.6	−0.9	−0.6	−0.6	−0.2	−0.6	−0.1	0.2	−0.5
8, 8	0.3	0.3	0.4	0.4	0.4	0.3	0.4	0.4	0.5	0.7	0.7	0.6	0.4
8 a. m.	2.3	2.4	2.8	3.2	3.2	2.7	2.4	2.0	2.0	2.5	2.5	2.2	2.3
Hermosillo:													
7, 2, 9	−0.7	0.9	1.0	0.8	0.8	−0.3	0.3	0.1	0.0	−0.6	−1.0	−0.4	0.2
8, 8	0.4	0.3	0.4	0.4	0.4	0.3	0.4	0.4	0.5	0.6	0.7	0.6	0.4
8 a. m.	4.4	4.8	5.6	6.1	6.1	5.3	4.1	3.9	3.9	4.7	4.5	4.0	4.7
Huejutla:													
7, 2, 9	0.3	0.4	0.4	0.0	−0.2	−0.4	−0.3	−0.3	0.1	0.1	0.2	0.1	0.4
8, 8	0.8	0.7	1.1	1.2	1.1	0.9	0.8	0.7	0.8	0.6	0.7	0.9	0.9
8 a. m.	2.1	1.8	2.4	2.9	2.5	2.4	1.9	1.7	2.0	1.7	1.6	2.1	2.1
Isla Mujeres:													
7, 2, 9	0.3	0.5	0.4	0.5	0.2	0.1	0.2	0.4	0.2	0.3	0.4	0.5	0.3
8, 8	0.4	0.4	0.5	0.5	0.4	0.3	0.3	0.4	0.3	0.2	0.4	0.5	0.4
8 a. m.	0.8	0.9	1.0	1.1	0.7	0.6	0.5	0.6	0.5	0.4	0.9	1.0	0.8
Izamal:													
7, 2, 9	−1.3	−1.1	−1.1	−1.2	−1.1	−1.3	−0.8	−0.6	−0.7	−1.6	−1.4	−1.2	−1.1
8, 8	1.1	1.2	1.2	1.2	1.0	1.0	1.0	1.1	1.2	0.9	1.0	1.2	1.1
8 a. m.	4.5	4.9	5.2	4.8	3.7	2.3	2.4	2.5	2.7	2.6	3.3	3.9	3.5
Jalapa:													
7, 2, 9	−0.3	0.0	0.0	−0.4	−0.2	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.0
8, 8	0.7	0.8	1.0	1.0	0.8	0.6	0.6	0.7	0.8	0.7	0.9	0.8	0.8
8 a. m.	1.9	2.1	2.2	2.0	1.6	1.4	1.4	1.6	1.5	1.6	1.8	2.0	1.8
La Barca:													
7, 2, 9	−0.6	−0.4	−0.5	−0.8	−0.9	−0.6	−0.2	−0.4	−0.8	−0.8	−0.4	−0.4	−0.5
8, 8	1.0	1.0	1.2	1.4	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.1	1.2
8 a. m.	5.9	6.3	6.5	6.5	6.0	4.3	3.8	3.8	4.0	4.6	5.1	5.8	5.3
Lagos:													
7, 2, 9	−0.3	−0.6	−0.7	−0.6	−0.3	−0.4	−0.8	−0.9	−1.2	−0.7	0.0	−0.2	−0.5
8, 8	0.9	0.9	1.2	1.3	1.1	1.2	1.2	1.3	1.0	1.0	1.0	0.9	1.1
8 a. m.	6.1	6.5	7.3	7.4	7.1	5.8	5.3	5.3	4.9	5.1	5.2	6.0	6.0
Lampazos:													
7, 2, 9	−0.5	−0.4	−0.3	0.3	0.9	0.5	0.0	−0.3	−0.4	0.5	0.2	0.2	0.1
8, 8	0.2	0.2	0.2	0.3	0.3	0.2	0.1	0.3	0.2	0.5	0.4	0.3	0.3
8 a. m.	3.1	3.3	3.5	3.5	4.2	3.7	4.0	4.3	3.7	3.8	3.0	3.4	3.6
Leon:													
7, 2, 9	−0.6	−0.5	−0.7	−0.5	−0.1	−0.2	−0.2	−0.5	−0.6	−0.8	−1.1	−0.8	−0.5
8, 8	0.8	0.8	1.0	1.2	1.0	1.0	1.0	1.0	0.9	1.0	0.9	0.9	1.0
8 a. m.	6.1	6.3	7.0	7.2	6.7	5.0	4.3	4.3	4.4	5.1	5.4	5.5	5.6
Manzanillo:													
7, 2, 9	−0.3	−0.5	−0.5	−0.4	−0.5	−0.3	0.2	−0.2	−0.3	−0.6	−0.4	−0.3	−0.3
8, 8	0.8	0.8	1.0	1.1	1.0	1.0	1.0	1.0	0.8	0.7	0.7	0.8	0.9
8 a. m.	2.0	2.1	2.3	2.5	2.3	2.2	2.2	2.6	2.0	1.9	2.0	2.1	2.2
Mascota:													
7, 2, 9	−0.6	−0.4	−0.5	−0.2	−0.1	0.0	0.1	0.5	0.3	−0.2	−0.8	−1.0	−0.1
8, 8	0.6	0.6	0.7	0.8	0.7	0.6	0.7	0.7	0.7	0.6	0.7	0.7	0.7
8 a. m.	4.5	4.8	4.7	4.6	4.0	3.4	2.8	2.6	2.4	2.6	3.0	4.2	3.7
Maxcanu:													
7, 2, 9	−1.1	−1.0	−0.9	−1.0	−1.2	−1.2	−1.0	−1.0	−0.7	−0.9	−0.6	−0.9	−1.0
8, 8	0.7	0.8	0.8	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.8	0.7
8 a. m.	3.9	4.3	4.4	4.3	3.7	2.4	2.6	2.7	2.5	2.7	3.3	3.6	3.4
Mazatlan:													
7, 2, 9	−0.2	−0.2	−0.1	−0.1	−0.2	−0.2	−0.3	−0.1	0.0	0.1	−0.1	0.1	−0.1
8, 8	0.2	0.2	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
8 a. m.	1.6	1.6	1.9	2.0	1.6	1.3	1.5	1.6	1.7	1.9	1.8	1.6	1.7
Merida:													
7, 2, 9	−1.1	−0.7	−0.5	−0.9	−1.0	−0.8	−0.6	−0.5	−0.6	−1.0	−0.8	−0.6	−0.7
8, 8	0.7	0.8	0.8	0.8	0.6	0.6	0.6	0.8	0.7	0.6	0.7	0.9	0.7
8 a. m.	3.0	3.2	3.5	3.1	2.4	1.7	1.7	1.9	1.9	1.9	2.5	2.9	2.5
Mexico:													
7, 2, 9	−0.3	−0.2	−0.4	−0.4	−0.4	−0.5	−0.5	−0.4	−0.4	−0.2	−0.2	−0.3	−0.3
8, 8	0.9	1.1	1.4	1.4	1.2	1.2	1.4	1.2	1.0	0.8	1.1	1.1	1.2
8 a. m.	5.3	5.5	5.9	5.4	4.3	3.7	3.3	3.4	3.3	3.6	4.4	4.7	4.4
Monterrey:													
7, 2, 9	−0.7	−0.5	−0.7	−0.4	−0.2	−0.6	−0.6	−0.7	−0.6	−0.4	0.0	0.4	−0.6
8, 8	0.4	0.4	0.4	0.6	0.5	0.4	0.4	0.6	0.7	0.7	0.7	0.6	0.5
8 a. m.	3.5	4.0	4.1	4.3	5.4	4.5	4.2	4.6	3.8	3.3	3.1	3.6	4.0
Morelia:													
7, 2, 9	−0.6	−0.4	−0.2	−0.4	−0.4	0.1	0.0	−0.4	−0.4	−0.8	−0.7	−0.6	−0.4
8, 8	0.8	0.8	1.1	1.2	1.0	1.0	1.0	1.0	0.8	0.7	0.9	0.9	0.9
8 a. m.	6.2	6.4	6.4	6.0	5.0	4.0	3.7	3.5	3.3	4.1	4.9	5.7	4.4
Oaxaca:													
7, 2, 9	−0.9	−1.1	−0.9	−0.9	−0.7	−0.3	−0.2	−0.5	−0.7	−1.1	−1.1	−0.9	−0.7
8, 8	1.1	1.1	1.5	1.5	1.1	1.2	1.4	1.3	1.1	0.9	1.1	1.2	1.2
8 a. m.	5.8	6.5	6.9	5.8	3.8	3.3	4.0	3.9	3.6	3.6	4.6	5.8	4.9
Ojinaga:													
7, 2, 9	−1.8	−1.8	−1.8	−1.9	−2.1	−0.8	0.0	0.1	−0.7	−1.4	−1.5	−2.0	−1.2
8, 8	1.8	1.2	1.0	1.1	1.1	0.9	1.1	1.2	1.3	1.5	1.8	1.5	1.4
8 a. m.	6.7	6.4	7.3	7.2	6.9	6.0	4.8	4.6	4.9	6.3	6.8	5.6	5.2
Pachuca:													
7, 2, 9	−1.4	−1.9	−2.1	−1.8	−0.7	−0.2	0.1	0.0	−0.4	−0.9	−0.7	−1.1	−0.9
8, 8	1.4	1.4	1.7	1.7	1.6	1.6	1.7	1.6	1.4	1.4	1.4	1.5	1.5
8 a. m.	3.9	4.2	4.3	4.0	3.4	3.1	3.2	2.9	3.0	3.1	3.5	3.7	3.5
Parral:													
7, 2, 9	−0.9	−1.4	−0.8	−0.4	−0.1	−0.7	−0.8	−0.8	−0.6	−0.8	−0.8	0.0	−0.6
8, 8	0.9	0.8	0.9	1.0	0.9	0.8	0.8	1.1	1.0	1.2	1.2	1.2	1.0
8 a. m.	6.4	6.2	6.2	6.5	7.4	5.1	3.4	4.4	4.4	5.5	6.2	6.1	5.8
Piedras Negras:													
7, 2, 9	−0.4	−0.1	0.1	0.1	0.0	−0.6	−1.4	−0.2	−0.2	0.2	0.1	0.1	−0.1
8, 8	0.4	0.4	0.4	0.5	0.5	0.4	0.6	0.6	0.7	0.8	0.8	0.6	0.6
8 a. m.	4.2	4.7	5.0	5.1	4.8	5.0	4.1	4.9	4.8	4.9	4.3	4.5	4.8
Peto:													
7, 2, 9	−1.6	−1.2	−1.2	−1.5	−1.5	−1.4	−1.1	−0.5	−0.5	−0.9	−0.9	−1.1	−1.1
8, 8	0.9	1.0	1.0	1.0	0.8	0.8	0.8	1.0	1.0	0.7	0.9	1.1	0.9
8 a. m.	4.5	4.9	5.2	4.8	3.6	2.3	2.5	2.5	2.7	2.9	3.4	4.1	3.6
Pochutla:													
7, 2, 9	−0.7	−0.7	−0.8	−0.9	−0.4	0.2	−0.5	−0.8	−0.3	−0.2	−0.6	−0.7	−0.5
8, 8	1.1	1.1	1.4	1.5	1.0	1.2	1.3	1.3	1.1	1.0	1.1	1.2	1.2
8 a. m.	4.5	4.5	4.7	4.3	3.1	3.4	3.7	3.2	3.1	3.2	4.1	4.4	3.8
Progreso:													
7, 2, 9	−0.5	−0.3	−0.3	−0.3	−0.3	−0.3	−0.3	0.1	0.0	−0.2	0.0	−0.1	−0.1
8, 8	0.7	0.8	0.8	0.8	0.6	0.5	0.6	0.5	0.4	0.6	0.6	0.8	0.7
8 a. m.	2.3	2.5	2.5	2.2	1.6	1.2	1.1	1.4	1.5	1.3	1.8	2.1	1.8
Puebla:													
7, 2, 9	−1.1	−1.0	−0.8	−0.4	−0.5	−0.1	−0.1	−0.4	−0.7	−1.0	−0.9	−0.9	−0.6
8, 8	0.9	0.9	1.3	1.3	1.1	1.0	1.2	1.1	0.9	0.7	0.9	1.0	1.0
8 a. m.	5.1	5.9	6.2	5.1	4.0	3.3	3.2	3.3	3.3	3.4	4.4	5.3	4.4
Queretaro:													
7, 2, 9	−0.5	−0.6	0.0	−0.2	−0.4	−0.3	−0.4	−0.5	−0.7	−0.8	−0.7	−0.6	−0.3
8, 8	0.9	0.9	1.2	1.3	1.1	1.1	1.1	1.1	0.9	0.8	1.0	1.0	1.0
8 a. m.	5.7	5.8	6.6	6.3	5.3	4.6	4.2	4.3	4.2	3.2	5.0	5.3	5.0
Rio Bravo:													
7, 2, 9	−0.3	−0.2	0.1	0.1	0.0	−0.1	−0.3	−0.9	−0.7	−0.4	−0.4	−0.2	−0.4
8, 8	0.3	0.3	0.3	0.4	0.4	0.3	0.6	0.5	0.4	0.7	0.6	0.6	0.4
8 a. m.	2.2	2.3	3.2	3.4	3.3	2.9	3.2	2.9	3.0	3.8	3.1	3.2	2.9
Salina Cruz:													
7, 2, 9	0.0	−0.2	0.0	0.1	0.1	0.3	0.3	0.2	0.0	0.1	0.1	0.2	0.2
8, 8	0.8	0.8	1.1	1.0	0.7	0.8	0.9	1.0	0.8	0.7	0.8	1.0	0.9
8 a. m.	2.0	2.2	3.0	3.0	2.2	2.3	2.8	3.0	2.6	2.1	2.0	2.4	2.6
Saltillo:													
7, 2, 9	−0.5	−0.8	−0.8	−0.4	−0.7	−0.3	0.1	−0.4	−0.6	−0.1	0.1	−0.4	−0.3
8, 8	0.4	0.4	0.5	0.6	0.5	0.3	0.3	0.4	0.5	0.6	0.6	0.5	0.5
8 a. m.	2.8	3.4	3.7	3.7	3.9	4.0	3.8	3.8	3.5	3.1	2.9	2.8	3.5
San Cristobal:													
7, 2, 9	−0.6	−0.7	−0.2	−0.1	−0.7	−0.2	−0.3	−0.4	−0.4	−0.3	−0.4	−0.4	−0.3
8, 8	0.9	0.9	1.0	1.2	1.0	0.8	0.7	0.7	0.6	0.7	0.8	0.9	0.8
8 a. m.	4.3	5.1	5.1	4.7	3.8	2.5	2.4	2.4	1.9	2.2	3.0	3.5	3.4
San Juan Bautista:													
7, 2, 9	0.1	0.4	0.6	0.5	0.5	0.3	0.0	0.4	0.1	0.2	0.5	0.5	0.3
8, 8	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.6	0.4	0.3	0.5	0.6	0.5
8 a. m.	1.4	1.6	1.6	1.6	1.3	1.4	1.5	1.4	1.2	1.0	0.9	1.2	1.3

TABLE 10.—*Corrections to reduce temperatures of the hours named to the 24-hour mean.* (°C.)—Continued.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
San Luis Potosi:													
7, 2, 9	−1.0	−0.4	−0.2	0.0	−0.2	−0.6	0.1	−0.1	−0.4	−0.5	−0.7	−0.8	−0.7
8, 8	0.6	0.6	0.7	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.7
8 a. m.	2.8	3.4	3.7	4.0	3.5	3.4	2.5	2.9	2.8	2.9	2.9	3.0	3.2
Sierra Mojada:													
7, 2, 9	−0.3	−0.4	−0.1	−0.1	−0.4	−0.2	−0.2	0.0	0.0	0.2	0.5	0.0	0.0
8, 8	0.5	0.5	0.5	0.7	0.6	0.4	0.5	0.6	0.6	0.8	0.7	0.6	0.6
8 a. m.	3.1	3.9	4.0	4.4	4.4	5.0	3.1	3.2	2.9	3.3	2.9	2.3	3.6
Silacayoapan:													
7, 2, 9	−1.3	−1.7	−1.4	−1.5	−1.2	−0.4	−0.5	−0.6	−0.9	−1.2	−1.4	−1.6	−1.1
8, 8	1.2	1.2	1.6	1.6	1.3	1.3	1.5	1.4	1.4	1.2	1.2	1.3	1.4
8 a. m.	6.0	6.0	6.2	5.8	4.5	3.7	3.9	4.1	4.2	4.6	5.1	5.2	5.0
Tapachula:													
7, 2, 9	−1.1	−1.1	−0.7	0.0	0.1	0.1	−0.1	−0.4	−0.7	−0.1	−0.3	−0.8	−0.4
8, 8	1.1	1.0	1.2	1.3	1.0	1.0	1.0	1.2	1.0	0.9	1.0	1.1	1.1
8 a. m.	3.8	3.9	4.2	3.8	2.3	2.2	2.5	2.6	2.1	2.3	3.1	3.7	3.1
Tampico:													
7, 2, 9	−0.2	−0.1	−0.4	−0.6	−0.4	−0.1	−0.1	0.5	−0.1	−0.1	0.0	−0.2	−0.1
8, 8	0.6	0.6	0.7	0.6	0.7	0.7	0.8	0.8	0.7	0.5	0.7	0.6	0.7
8 a. m.	1.7	1.3	1.5	1.5	1.5	1.1	1.5	1.7	1.6	1.5	1.8	1.4	1.5
Teocaltiche:													
7, 2, 9	−0.8	−0.8	−0.4	−0.4	−0.4	−0.4	−0.3	−0.3	−0.7	−0.6	−0.4	−0.2	−0.5
8, 8	0.8	0.8	1.0	1.2	1.0	1.0	1.0	1.0	0.9	1.0	0.9	0.9	0.9
8 a. m.	7.1	7.4	7.8	7.7	7.0	5.8	4.5	4.5	4.6	5.7	7.0	7.3	6.3
Tepic:													
7, 2, 9	−0.1	−0.3	−0.6	0.0	0.0	−0.4	−0.6	−0.6	−0.8	−0.6	−0.6	−0.7	−0.4
8, 8	0.5	0.5	0.6	0.7	0.6	0.5	0.6	0.6	0.6	0.7	0.6	0.5	0.6
8 a. m.	3.3	3.7	3.8	3.4	3.1	2.9	2.8	2.6	2.6	3.0	3.4	3.5	3.2
Tlaxcala:													
7, 2, 9	−0.8	−1.0	−0.8	−0.9	−0.8	−0.4	−0.1	−0.5	−1.0	−1.2	−1.1	−0.6	−0.8
8, 8	1.1	1.1	1.5	1.5	1.3	1.2	1.4	1.3	1.1	0.9	1.1	1.2	1.2
8 a. m.	5.6	5.8	6.2	5.0	4.3	3.4	3.4	3.6	3.8	3.7	4.3	5.1	4.5
Toluca:													
7, 2, 9	−1.0	−1.2	−0.5	−0.6	−0.7	−0.7	−0.5	−0.5	−0.7	−0.8	−1.0	−0.8	−0.7
8, 8	0.9	0.9	1.3	1.3	1.3	1.1	1.2	1.1	0.9	0.9	0.9	1.0	1.1
8 a. m.	5.4	5.7	5.7	4.2	4.0	3.4	3.0	3.1	2.8	3.4	4.4	4.9	4.3
Torreon:													
7, 2, 9	0.1	0.1	−0.1	0.1	−0.2	0.0	0.0	−0.3	−0.3	0.3	0.4	0.5	0.0
8, 8	0.3	0.3	0.3	0.5	0.4	0.3	0.4	0.5	0.4	0.6	0.6	0.6	0.4
8 a. m.	5.3	5.5	5.7	5.7	5.3	4.7	4.3	4.5	4.1	5.4	5.0	5.2	5.0
Tuxtepec:													
7, 2, 9	−0.5	−0.3	−0.3	−0.1	−0.3	0.1	0.2	0.2	0.2	−0.4	−0.5	−0.1	−0.2
8, 8	0.7	0.8	0.9	0.9	0.8	0.8	0.8	0.9	0.7	0.6	0.7	0.8	0.8
8 a. m.	2.6	2.9	3.5	3.6	3.2	2.7	2.9	2.7	2.2	1.5	1.4	2.1	2.5
Tuxtla Gutierrez:													
7, 2, 9	−0.6	−0.8	−0.5	−0.2	−0.9	−0.7	−0.5	−0.4	−0.6	−0.4	−0.6	−0.5	−0.6
8, 8	0.6	0.6	0.8	0.9	0.7	0.7	0.7	0.8	0.8	0.6	0.6	0.8	0.7
8 a. m.	3.1	3.6	3.9	3.4	2.8	2.4	2.5	2.6	2.7	2.8	2.2	2.9	2.8
Ulua:													
7, 2, 9	0.0	−0.1	0.2	0.2	0.3	0.4	0.4	0.2	−0.1	0.0	−0.2	−0.3	0.1
8, 8	0.5	0.6	0.8	0.8	0.6	0.6	0.6	0.7	0.5	−0.4	0.6	0.6	0.6
8 a. m.	1.8	1.7	2.0	1.9	1.4	1.8	2.0	2.4	2.1	1.9	1.9	1.9	1.8
Valladolid:													
7, 2, 9	−1.2	−0.8	−0.2	−0.4	−0.8	−0.3	0.0	0.1	−0.3	−1.0	−1.0	−0.8	−0.8
8, 8	0.9	1.0	1.0	0.9	0.8	0.9	0.8	0.9	1.0	0.7	0.9	1.1	0.8
8 a. m.	3.3	3.5	3.3	2.9	2.1	1.5	1.2	1.4	1.8	2.1	2.6	3.0	3.3
Valle de Bravo:													
7, 2, 9	−0.4	−0.4	−0.3	−0.4	−0.3	−0.2	0.0	−0.2	−0.3	−0.6	−0.5	−0.4	−0.3
8, 8	0.7	0.7	1.0	1.1	0.9	0.9	0.9	0.9	0.7	0.6	0.8	0.8	0.8
8 a. m.	4.9	5.1	5.5	5.5	4.5	3.3	3.2	3.0	2.8	3.2	4.0	4.2	4.1
Vigia Chico:													
7, 2, 9	0.3	0.3	0.5	0.2	0.2	−0.1	−0.4	−0.2	−0.3	−0.1	0.2	−0.5	0.1
8, 8	0.6	0.7	0.7	0.7	0.5	0.5	0.5	0.7	0.7	0.5	0.6	0.8	0.6
8 a. m.	1.5	1.6	1.4	1.4	1.5	1.7	1.3	1.2	1.3	1.6	1.7	1.9	1.4
Xkalak:													
7, 2, 9	−0.1	−0.1	−0.2	−0.2	−0.4	−0.4	−0.4	−0.3	−0.6	−0.9	−0.5	0.0	−0.4
8, 8	0.8	0.9	0.9	0.9	0.7	0.7	0.7	0.9	0.9	0.7	0.8	1.0	0.8
8 a. m.	1.3	1.4	1.5	1.4	1.0	1.2	1.2	1.3	1.4	1.3	1.4	1.5	1.3
Zacatecas, Bufa:													
7, 2, 9	0.2	0.2	0.1	−0.3	−1.1	−0.7	−0.8	−0.9	−1.0	−1.0	−0.7	0.0	−0.6
8, 8	0.6	0.6	0.7	0.9	0.7	0.7	0.8	0.8	0.7	0.7	0.7	0.8	0.7
8 a. m.	2.9	3.0	4.0	4.6	4.3	3.7	3.6	2.5	3.4	3.6	3.4	3.2	3.5
Zacualtipan:													
7, 2, 9	0.4	−0.3	−0.8	−0.8	−0.2	0.0	0.0	0.0	−0.3	−0.2	0.1	0.2	−0.2
8, 8	0.7	0.7	0.8	0.7	0.8	0.8	0.9	0.9	0.8	0.6	0.8	0.8	0.8
8 a. m.	1.3	2.3	2.5	2.4	2.3	2.3	2.3	2.4	2.2	2.1	2.1	2.0	2.3

TABLE 11.—*24-hour mean temperatures by reduction.* (°C.)

(See Tables 3 and 10.)

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Ahualuco	15.7	16.7	10.2	22.3	23.8	23.4	22.6	22.1	21.7	20.8	18.0	16.1	20.2
Autlan	18.6	19.5	22.0	23.9	25.2	25.7	24.4	23.1	22.6	21.7	20.1	19.0	22.2
C. Guzmàn	15.5	16.8	18.7	20.3	21.5	21.5	20.5	20.2	19.6	18.9	17.9	15.9	18.9
C. Juarez	6.2	8.6	12.6	17.2	22.1	25.5	26.1	25.1	22.2	16.8	11.0	6.4	16.7
C. Victoria	15.3	17.2	21.3	24.5	26.6	27.9	26.9	27.9	26.2	22.9	19.0	16.2	22.7
Colima	21.3	21.5	22.7	23.9	24.9	25.6	24.9	24.3	24.1	23.3	22.5	21.4	23.4
Colotlan	13.8	15.5	19.1	21.4	23.1	24.4	22.3	21.3	21.1	19.9	16.4	13.4	19.3
Comitan	14.8	15.3	17.5	19.4	19.3	18.7	18.1	18.1	18.2	17.4	16.1	15.6	17.4
Cuernavaca	18.0	19.4	21.6	23.4	23.2	21.8	20.8	20.1	20.1	19.4	18.6	17.7	20.4
Culiacàn	19.5	19.6	21.0	23.3	26.0	28.7	28.9	28.2	27.9	25.9	22.3	19.4	24.2

TABLE 11.—*24-hour mean temperatures by reduction.* (°C.)—Contd.

Station.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
Chignahuapan	7.9	8.9	11.2	13.4	14.6	14.3	13.7	13.4	12.8	11.1	9.4	8.1	11.6
Chihuahua	10.9	12.4	16.5	20.4	24.9	26.4	25.3	24.6	22.7	19.0	13.6	10.2	18.9
Durango	11.9	13.8	16.7	19.0	20.6	21.9	20.6	19.7	18.4	16.6	14.2	12.2	17.1
Fuerte	17.4	17.8	20.1	23.0	26.3	30.0	29.4	28.3	28.1	25.5	21.4	17.4	23.7
Guadalajara	15.4	16.8	19.0	21.7	23.3	22.9	21.6	20.8	20.1	19.0	17.5	15.6	19.5
Guanajuato	13.3	15.0	17.7	20.2	20.8	19.9	18.9	18.8	18.6	17.5	15.5	14.0	17.5
Guaymas	18.4	19.3	21.5	23.8	26.2	28.7	30.4	30.4	30.0	27.2	22.3	18.9	24.7
Hermosillo	16.9	18.2	21.0	23.7	26.9	29.9	31.5	30.8	29.9	25.2	19.7	16.2	24.2
Huejutla	19.7	20.7	24.0	26.5	27.9	28.3	27.7	27.4	26.8	24.5	22.1	20.3	24.8
Isla Mujeres	24.1	24.6	25.6	26.1	27.2	27.3	27.6	28.0	27.5	26.4	25.2	24.7	26.2
Izamal	20.5	21.8	24.1	26.0	27.2	26.1	25.6	25.5	25.3	23.9	22.3	21.2	24.1
Jalapa	13.5	14.8	17.0	19.0	20.0	19.2	18.8	18.9	18.4	17.3	16.0	14.7	17.3
La Barca	14.7	16.4	19.2	21.6	23.1	22.8	21.3	20.6	20.0	19.0	17.7	15.5	19.3
Lagos	13.5	14.5	17.2	19.5	21.3	21.7	20.2	19.7	19.0	18.4	16.5	14.1	18.0
Lampazos	13.1	14.6	19.0	22.9	27.2	29.5	29.3	29.7	27.1	22.6	17.8	13.8	22.2
Leon	13.0	15.0	18.0	21.0	22.8	22.2	20.5	19.9	19.1	17.5	15.1	13.2	18.1
Manzanillo	23.7	23.3	23.9	25.3	27.0	28.6	28.6	28.2	27.6	27.1	25.9	24.4	16.1
Mascota	16.0	16.2	17.5	19.5	21.3	22.8	21.9	20.9	20.5	19.6	17.4	16.4	19.2
Maxcanu	21.0	22.4	24.7	26.5	27.5	26.7	26.0	26.0	25.7	24.4	22.9	21.4	24.6
Mazatlan	20.8	20.4	21.5	22.7	24.6	27.3	28.0	28.3	28.3	27.3	24.3	21.7	24.6
Merida	21.2	22.4	24.6	26.2	27.4	28.9	26.4	26.5	26.3	25.0	23.5	22.1	24.9
Mexico	11.6	13.6	15.6	17.5	18.1	17.7	16.7	16.7	16.2	14.9	13.9	12.1	15.4
Monterrey	14.2	15.6	19.5	22.5	26.1	27.4	27.2	27.4	25.2	21.2	17.3	14.9	21.5
Morelia, Obs.	13.2	14.7	17.2	19.2	19.8	18.8	18.2	17.6	17.2	16.0	14.7	13.3	16.7
Morelia, Sem.	12.4	13.9	16.1	18.0	18.8	18.6	17.4	17.0	16.5	15.1	14.3	13.2	15.9
Oaxaca	15.6	17.1	19.5	21.5	21.5	20.7	20.2	19.9	19.3	18.4	17.5	16.4	19.0
Ojinaga	13.2	14.8	18.8	22.5	26.3	30.0	30.5	30.3	26.9	21.3	16.0	11.8	21.9
Pachuca	11.0	12.2	13.9	15.5	16.6	16.2	15.7	15.2	14.8	14.0	12.8	11.4	14.1
Parral	10.1	11.6	14.7	18.1	22.5	22.7	21.4	20.6	19.0	16.0	12.2	10.0	16.6
Peto	20.3	21.9	24.1	25.8	26.7	26.2	25.4	25.6	25.2	23.8	22.3	21.0	24.0
Piedras Negras	11.9	14.4	19.2	22.0	26.0	29.6	29.6	30.6	27.1	21.6	15.4	11.0	21.5
Pachutla	23.6	24.5	25.8	27.0	27.4	27.2	26.1	25.9	26.1	25.8	24.7	23.8	25.7
Progreso	21.7	22.3	23.7	25.1	26.3	25.8	26.4	26.6	26.9	26.1	24.4	22.8	24.9
Puebla	11.2	12.3	14.7	17.1	17.5	16.9	16.5	16.3	15.5	14.6	13.3	11.6	14.8
Queretaro	13.1	14.6	17.8	20.0	20.9	20.3	19.2	18.7	17.9	16.6	15.1	13.5	17.3
Rio Bravo	15.1	16.7	20.9	23.7	26.9	29.6	28.4	28.3	26.4	23.7	18.5	15.4	22.8
Salina, Cruz	24.8	25.2	26.7	28.0	28.4	28.0	28.0	28.2	27.8	27.2	26.2	25.3	27.0
Saltillo	11.2	13.7	16.6	19.2	22.2	23.4	21.8	22.3	19.9	16.5	13.6	11.0	17.6
S. Cristobal	10.7	11.7	13.6	14.1	15.7	15.6	14.7	14.4	14.6	14.6	13.6	11.7	13.7
S.JuanBautista	22.7	23.8	26.2	28.1	29.5	28.7	28.5	28.6	27.6	26.2	24.9	23.6	26.5
S. Luis Potosi	10.4	12.9	15.9	19.0	20.5	20.4	19.3	19.2	18.2	15.9	14.0	12.2	16.5
Sierra Mojada	12.9	14.5	18.1	20.9	23.9	25.4	24.6	24.2	21.8	18.6	15.1	12.0	19.3
Silacaycapan	15.4	16.8	19.0	20.4	20.5	20.2	19.3	19.0	18.8	18.2	17.0	15.7	18.4
Tapachule	23.7	24.8	26.3	27.3	26.9	25.9	25.0	24.6	24.2	25.0	25.6	24.6	25.3
Tampico	19.4	20.0	22.4	24.6	26.7	27.9	27.8	27.9	27.3	24.8	22.1	19.2	24.2
Teccaltiche	12.6	14.0	17.3	20.0	22.2	22.5	20.7	19.9	19.2	17.8	14.8	13.3	17.9
Tepic	14.9	16.0	18.4	21.0	22.6	23.3	22.6	21.4	21.0	20.6	18.6	15.7	19.7
Tlaxcala	11.6	12.9	15.3	16.9	17.5	17.0	16.6	16.1	15.6	14.9	13.5	12.4	15.0
Toluca	7.9	9.1	11.9	13.9	14.9	14.5	13.6	13.5	12.8	11.7	9.9	8.6	11.9
Torreon	14.0	15.8	19.7	22.9	25.0	26.8	26.4	26.5	24.0	20.9	17.2	13.8	21.1
Tuxtepec	20.6	21.7	24.0	26.7	28.0	27.6	26.6	26.5	26.4	24.6	22.8	21.6	24.7
Tuxtla Gutierrez	20.7	21.8	23.5	25.7	26.3	25.8	24.9	24.7	24.9	23.8	22.4	21.4	23.8
Ulua	21.2	21.5	23.6	25.5	26.8	27.4	27.3	27.2	26.4	25.4	23.4	21.3	24.7
Valladclid	20.5	21.8	24.2	25.7	26.4	26.5	26.3	26.3	25.8	24.1	22.5	21.4	24.3
Valle de Bravo	12.8	14.1	16.6	18.3	19.4	18.5	17.5	16.7	16.4	15.6	14.7	13.4	16.2
Vigia Chico	22.5	23.8	25.1	25.8	26.7	27.1	26.9	27.2	26.9	25.7	24.4	23.2	25.5
Xkalak	23.8	24.4	25.5	26.6	27.4	27.7	27.7	27.7	26.9	25.5	24.6	24.3	26.0
Zacatecas, Inst.	9.6	11.0	13.5	16.2	17.8	17.4	15.6	15.8	14.7	13.1	11.7	10.4	13.9
Zacatecas, Bufa	10.4	11.4	13.7	15.7	16.5	16.6	15.4	15.3	14.1	12.9	11.9	11.2	13.8
Zacualtipan	9.3	9.9	11.6	13.9	15.9	15.7	15.2	15.0	14.2	12.6	11.0	9.6	12.8

On Figure 40, giving the values of 24 − (8, 8), there are noted as a rule in the northeastern and northwestern parts of the United States the 0 curves. There is noted also an increase in correction values with approach to the interior of the continent. Centers of maximum correction are found at Dodge City and Charleston in the United States. The center of Ojinaga, Mexico, is secondary to the first of the two centers just mentioned. In all of the Gulf region we find small corrections (annual +0.6°), whose principal centers (+0.4°) are located at Corpus Christi and Key West. The rather considerable extent of the island of Cuba gives rise to a relative maximum in accordance with what has been set forth. The remainder of the Antillean region is divided into belts whose limiting curves have a north-south orientation; the annual correction is 0°C. for the longitude of Porto Rico and −0.2°C. (annual) for that of Basseterre, Roseau, and Port of Spain. As is to be supposed both the corrections 24 − (8, 8) and (7, 2, 9) − (8, 8) are considerably influenced by longitude since the observations are made simultaneously at 8 a. m. and 8 p. m. 75th meridian time, and

these hours correspond to hours of local time extending over a large part of the day, from 4 a. m. and 4 p. m. in Washington, Oregon, and California to 9 a. m. and 9 p. m. at Basseterre, Roseau, and Port of Spain.

The general distribution of corrections in all of this immense area is very much the same during the course of the year, but just for that large region that has been taken into consideration the annual variation of the values is not uniform, but there is a difference relative to time of occurrence of maximum and minimum. There is noted, however, a tendency to minimum values in June and July, when the correction gradient is least. The date of the maximum is altogether variable; in the United States it is in the autumn; in Mexico, in March or April; and in the Antilles, in January.

The charts for the corrections 24 h. – 8 a. m. are very much similar to those for the corrections 24 h. – (8, 8), exception being made, of course, as to the magnitude of the values. Distance from the seas influence these values, but the center of maximum removes considerably toward the southwest in the region of greatest diurnal variation, especially in the winter months (January), during which minimum and early morning temperatures are very low in Sonora, Sinaloa, and Chihuahua. In summer (July) the opposite is observed; the center of maximum correction is shifted toward the northwestern part of the United States, the value being +7°C. In the *Mesa Central*, too, there exists a center of maximum correction with extreme value of +5°C., and in the peninsula of Yucatan and in Cuba we note, as in the corrections studied previously, the presence of high values, especially in winter.

On account of the influence of longitude the curve of zero correction is found in the Antilles throughout the year. The mean positions of the same are as follows: In winter, 65°; in summer, 78°; for the year, 72° west longitude.

The mean annual position of the curve of zero correction (72° west longitude) differs but little from that of the meridian at which observation is made at 8 a. m. local time, which indicates that the daily temperature in that zone coincides with that of an hour of the day not far from 8 a. m. This hour of coincidence changes during the course of the year; it is advanced in July and retarded in January, hence the oscillation of the 0° curve between longitudes 65° and 78° west.

After the corrections for reducing the means of the systems 8, 8 and 8 a.m. to the means of 24-hourly observations are known there can be obtained by use of formula (1) the correction values corresponding to the system 7, 2, 9:

$$[24-(7, 2, 9)]=[24-(8, 8)]-[(7, 2, 9)-(8, 8)]$$

or $$[24-(7, 2, 9)]=[24-8 \text{ a. m.}]-[(7, 2, 9)-8 \text{ a. m.}]$$

In this manner there were obtained by successive calculations for each station and for each month the values of the correction 24 – (7, 2, 9) that appear in Table 10 and graphically in Figure 46.

PART IV.

The reduction of temperatures to sea level.

On taking up the difficult problem of the reduction of temperatures to sea level it becomes necessary to dwell anew upon the exceptional situation of the country, which complicates in such noticeable manner the solution of the different subjects relating to meteorology.

One of the factors that greatly influence the normal march of climatic elements is topography; the points of observation are located on a surface whose features are accidental in the extreme and under conditions that are so diversified that there are no two stations in all of the country—exception being made of the peninsula of Yucatan—having similar topography.

Due to this lack of homogeneity at the points of observation it follows that the thermometer readings show a certain more or less marked anomaly relative to the theoretical values that would obtain under less diversified surface relief. The magnitude of the anomalies due to the causes that we set forth may amount to 2 or 3° C.

In the studies that are based on observations at the ground surface this circumstance is not of importance, but in the reduction of those values to sea level it is of capital importance, for which reason there should be obtained the greatest possible homogeneity relative to the topographical conditions at the places of observation, but in our country this is impracticable, making the reduction to sea level according to the usual methods plainly impossible.

It is judged that the 70 stations in the system (*Red Meteorologico de Mexico*), whose data form the basis of this work, are classified according to elevation as follows:

Stations with elevation less than 500 meters	27
Stations with elevation 500–1,500 meters	12
Stations with elevation 1,500–2,500 meters	29
Stations with elevation greater than 2,500 meters	2

From this it is seen that the temperatures of only 27 stations can be reduced to sea level directly, adopting as reduction coefficients the values given by the law relative to decrease in temperature with elevation. The great majority of the remaining stations lie at considerable elevations, 31 of them above 1,500 meters, and the same method can not be applied.

Since the stations that may be considered as low are found only in the vicinity of the coasts it is impossible to omit the reduction to sea level with respect to the temperatures of the elevated stations and derive the reduced temperatures for such stations by interpolation on the charts traced from the data relating to the first group of stations. However, by using a map of sufficient size, including half of the American Continent, with the aid of similar reduction charts for the United States and with the added circumstance that the territory of Mexico has relatively limited extent in geographical longitude, there can be traced from the data for the low stations a type of isotherms serving as a first approximation.

In the United States with conditions facilitating this class of study brilliant successes have been achieved by the Weather Bureau at Washington, and in the reduction of temperatures to sea level there has been applied a method that is evidently excellent, as can be seen in the "Report of the Chief of the Weather Bureau" for 1900–1901, Volume II.

If the method indicated in that work should be followed closely, and temperatures first reduced to different selected plans—for example to 500 meters, 1,000 meters, 1,500 meters, etc., according to the particular elevation of each station—it would be possible to arrive at acceptable results, but the existence of important anomalies relative to the temperatures of many stations of the country does not permit this. If, on the other hand, there should be eliminated from the calculation the stations whose data indicate the existence of a certain anomaly, the number of points of observation remaining would certainly not be sufficient to bring the work to a successful termination, one of the requisite conditions being that of taking into consideration the greatest possible number of stations, from whose data the best result may be attained.

In view of the impossibility of reducing the temperatures to sea level in a direct way it was necessary to have recourse to the employment of an indirect method which has given, in this instance, results entirely satisfactory and which can be appraised as having an acceptable degree of accuracy.

If we enter on a map of that portion of the globe that is to be studied the stations whose data are to be submitted to reduction to sea level we can then proceed to divide them into groups, each group determining a center which can be located by taking the mean of the geographic coordinates of the stations constituting the group.

The general conditions that should be complied with in the selection of the groups consist in the assimilation into each group the greatest possible number of stations, relatively short distances separating the stations, a sufficiently great difference in elevations, and then a suitable distribution of the centers of reduction. In the present instance we have formed 17 groups from the 70 stations; the calculation of the coordinates of the centers is given in Table 12, and their locations are shown on Figure 47.

TABLE 12.—*Centers of reduction. Grouping of stations and geographical coordinates of centers.*

Centers and stations.	Elevation.	Latitude, north.	Longitude, west.
	Meters.	°	°
(1) Guaymas	9	27.9	110.9
Hermosillo	218	29.1	110.9
C. Juarez	1,134	31.7	106.5
Chihuahua	1,423	28.6	106.1
		29.3	108.6
(2) Guaymas	9	27.9	110.9
Culiacan	53	24.8	107.3
Mazatlan	78	23.1	106.4
Fuerte	102	26.5	108.7
		25.6	108.3
(3) Mazatlan	78	23.1	106.4
Fuerte	102	26.5	108.7
Torreon	1,135	25.6	103.4
Sierra Mojada	1,528	27.3	103.7
Parral	1,730	26.9	106.0
Durango	1,903	24.0	104.5
		25.6	105.5
(4) Piedras Negras	221	28.7	100.5
Lampazos	317	27.0	100.5
Monterrey	533	25.7	100.3
Ojinaga	800	29.6	104.4
Torreon	1,135	25.6	103.4
Sierra Mojada	1,528	27.3	103.7
Saltillo	1,605	25.4	101.0
		27.0	102.1
(5) Rio Bravo	30	26.0	98.0
Piedras Negras	221	28.7	100.5
Lampazos	317	27.0	100.5
C. Victoria	324	23.7	99.1
Monterrey	533	25.7	100.3
Saltillo	1,605	25.4	101.0
		26.1	99.9
(6) Tampico	24	22.2	98.0
C. Victoria	324	23.7	99.1
Torreon	1,135	25.6	103.4
Saltillo	1,605	25.4	101.0
Queretaro	1,842	20.6	100.3
San Luis Potosi	1,887	22.2	101.0
Zacatecas, Inst	2,443	22.6	102.6
		23.2	100.5
(7) Mazatlan	78	23.2	106.4
Tepic	930	21.5	105.0
Colotlan	1,683	22.6	103.6
Durango	1,903	24.0	104.6
Zacatecas, Inst	2,443	22.6	102.6
		22.8	104.4
(8) Manzanillo	4	19.0	104.3
Colima	507	19.2	103.7
Tepic	930	21.5	105.0
Autlan	1,003	19.5	104.5
Mascota	1,238	20.6	104.7
Ahualulco	1,325	20.8	103.9
C. Guzman	1,529	19.6	103.5
Guadalajara	1,558	20.7	103.4
Colotlan	1,683	22.6	103.6
		20.4	104.1
(9) Manzanillo	4	19.0	104.3
Colima	507	19.2	103.7
C. Guzman	1,529	19.6	103.5
La Barca	1,532	20.3	102.5
Teocaltiche	1,724	21.2	102.3
Leon	1,809	21.1	101.6
Lagos	1,872	21.4	101.9
Morelia (Obs.)	1,925	19.7	101.1
Morelia (Sem.)	1,933	19.7	101.1
Guanajuato	2,037	21.0	101.3
		20.2	102.3
(10) Manzanillo	4	19.0	104.3
Salina Cruz	56	16.2	95.2
Pochutla	164	15.7	96.5
Colima	507	19.2	103.7
		17.5	99.9
(11) Ulua	12	19.2	96.1
Tampico	24	22.2	98.0
Huejutla	316	21.1	98.4
Jalapa	1,399	19.5	96.9
Cuernavaca	1,540	18.9	99.2
Valle de Bravo	1,825	19.2	100.0
Queretaro	1,842	20.6	100.3
Zacualtipan	2,024	20.5	98.6
Puebla	2,150	19.0	98.1
Tlaxcala	2,240	19.3	98.2
Mexico	2,259	19.4	99.1
Chignahuapan	2,270	19.9	98.0
Pachuca	2,436	20.1	98.7
Toluca	2,676	19.3	99.7
		19.9	98.5
(12) Ulua	12	19.2	96.1
Tampico	24	22.2	98.0
Tuxtepec	25	18.1	96.1
Huejutla	316	21.1	98.4
Jalapa	1,399	19.5	96.9
		20.0	97.1
(13) Ulua	12	19.2	96.1
Tuxtepec	25	18.1	96.1
Salina Cruz	56	16.2	95.2
Pochutla	164	15.7	96.5
Jalapa	1,399	19.5	96.9
Oaxaca	1,563	17.1	96.7
Silacayoapan	1,635	17.5	98.2
Puebla	2,150	19.0	98.1
		17.8	97.0
(14) Ulua	12	19.2	96.1
San Juan Bautista	22	18.0	92.9
Tuxtepec	25	18.1	96.1
Salina Cruz	56	16.2	95.2
Tuxtla Gutz	536	16.6	93.1
		17.6	94.7
(15) San Juan Bautista	22	18.0	92.9
Salina Cruz	56	16.2	96.1
Tapachula	187	14.9	92.3
Tuxtla Gutierrez	536	16.6	93.1
Comitan	1,635	16.2	92.1
San Cristobal	2,118	16.7	92.6
		16.4	93.2
(16) Vigia Chico	0	19.8	87.6
Xkalak	0	18.2	87.8
Tapachula	187	14.9	92.3
Comitan	1,635	16.2	92.1
San Cristobal	2,118	16.7	92.6
		17.2	90.5
(17) Isla Mujeres	0	21.1	86.7
Vigia Chico	0	19.8	87.6
Xkalak	0	18.2	87.8
Maxcanu	12	19.8	90.5
Progreso	15	20.6	90.0
Izamal	16	20.9	89.0
Merida	22	21.0	89.6
Valladolid	22	20.7	88.2
Peto	36	20.0	88.9
		20.2	88.7

It only remains to locate the different stations of a group in a system of coordinates, taking as abscissas the temperature values for each station and as ordinates the respective elevations, the operation being made separately for each group. The series of points, as many as there are stations referred to a center of correction, will give a curve that will be classified according to its characteristics, but in the present case it will generally belong to the first or second degree.

When the elements entered as coordinates are subjected to mathematical analysis by least square methods the points of the curve are found.

The final value derived for the point whose ordinate is zero is undoubtedly that which indicates the temperature at sea level at the point whose geographical coordinates correspond to the center of reduction.

From the monthly values[1] of t_0 for each of the centers of reduction charts have been drawn showing the isotherms at sea level for the territory of Mexico. The results obtained in this manner are supplemented by the isotherms for the United States and the Antilles.

[1] Values from the formula of Bessel and Fourier.

Fig. 47. Centers of reduction to sea-level.

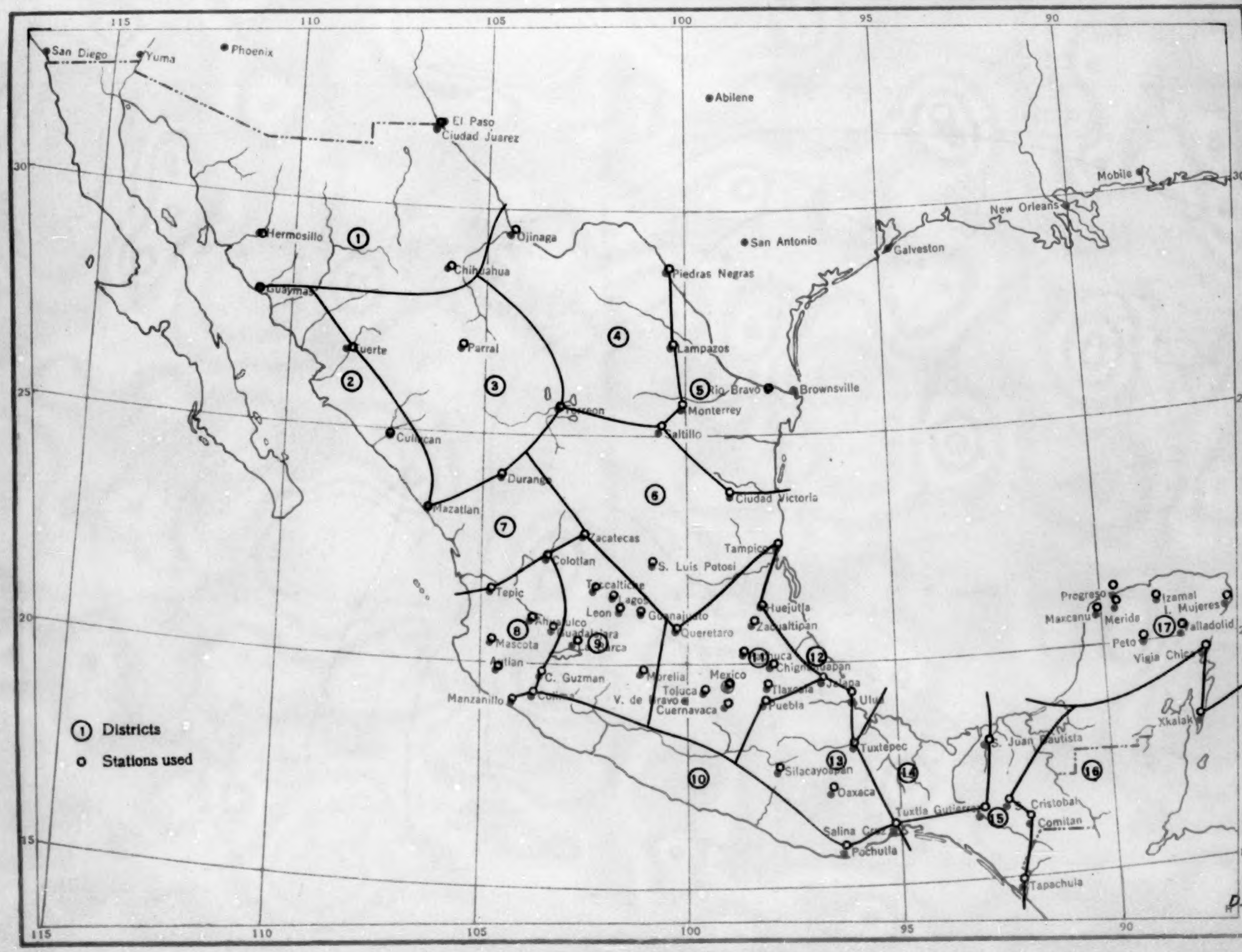


Fig. 48. Variation of temperature with altitude.

Average per 100 meters in zone 0–1,500 m.

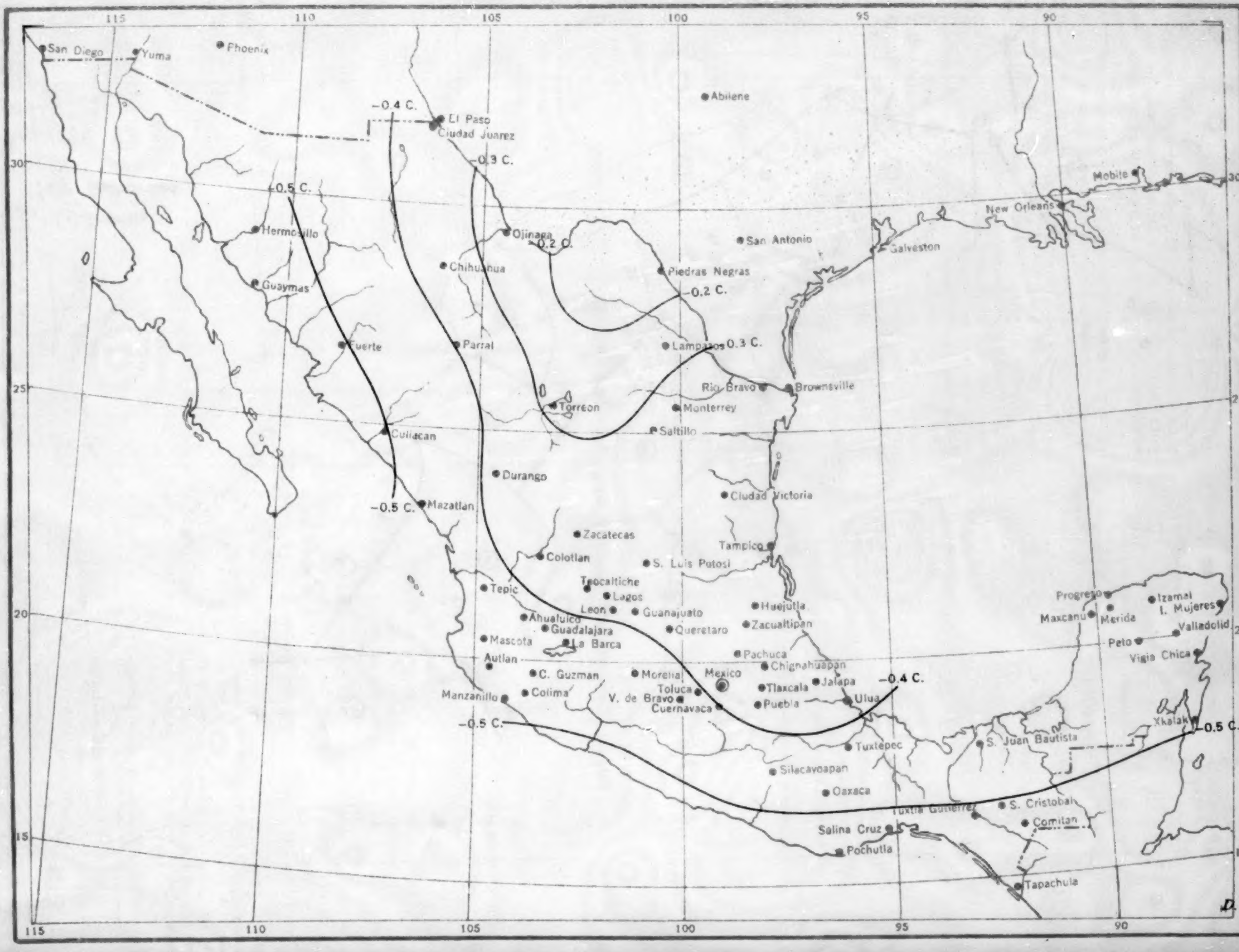


Fig. 50. Temperature gradients in latitude and longitude (°C.), January.

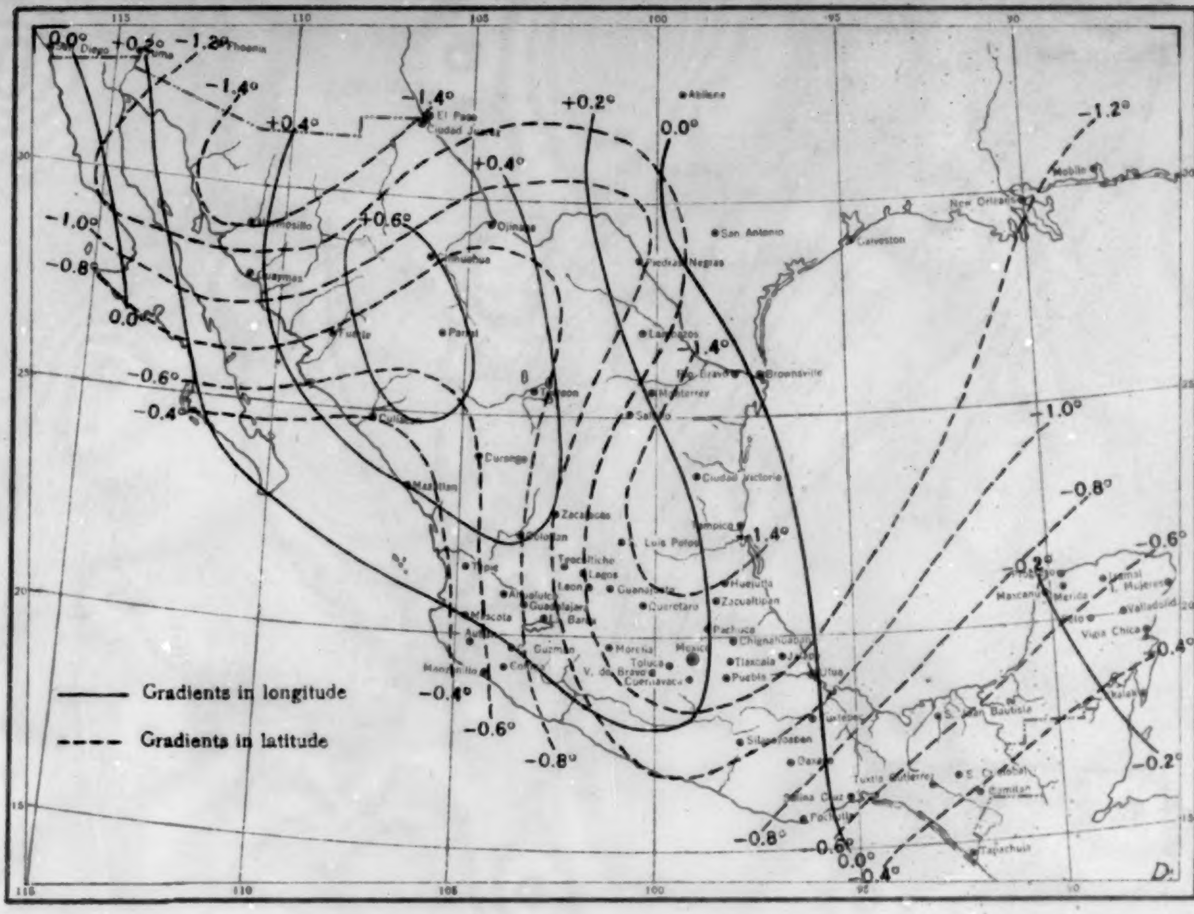


Fig. 51. Temperature gradients in latitude and longitude (°C.), February.

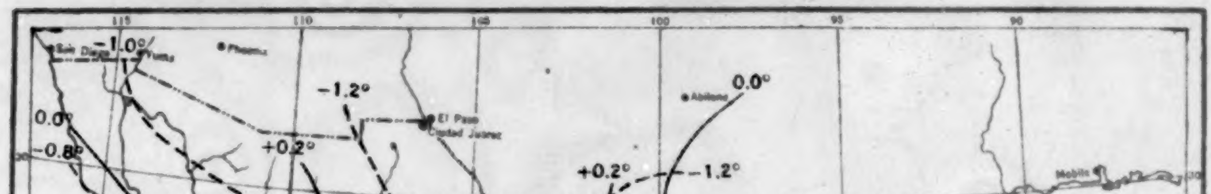


Fig. 52. Temperature gradients in latitude and longitude (°C.), March.

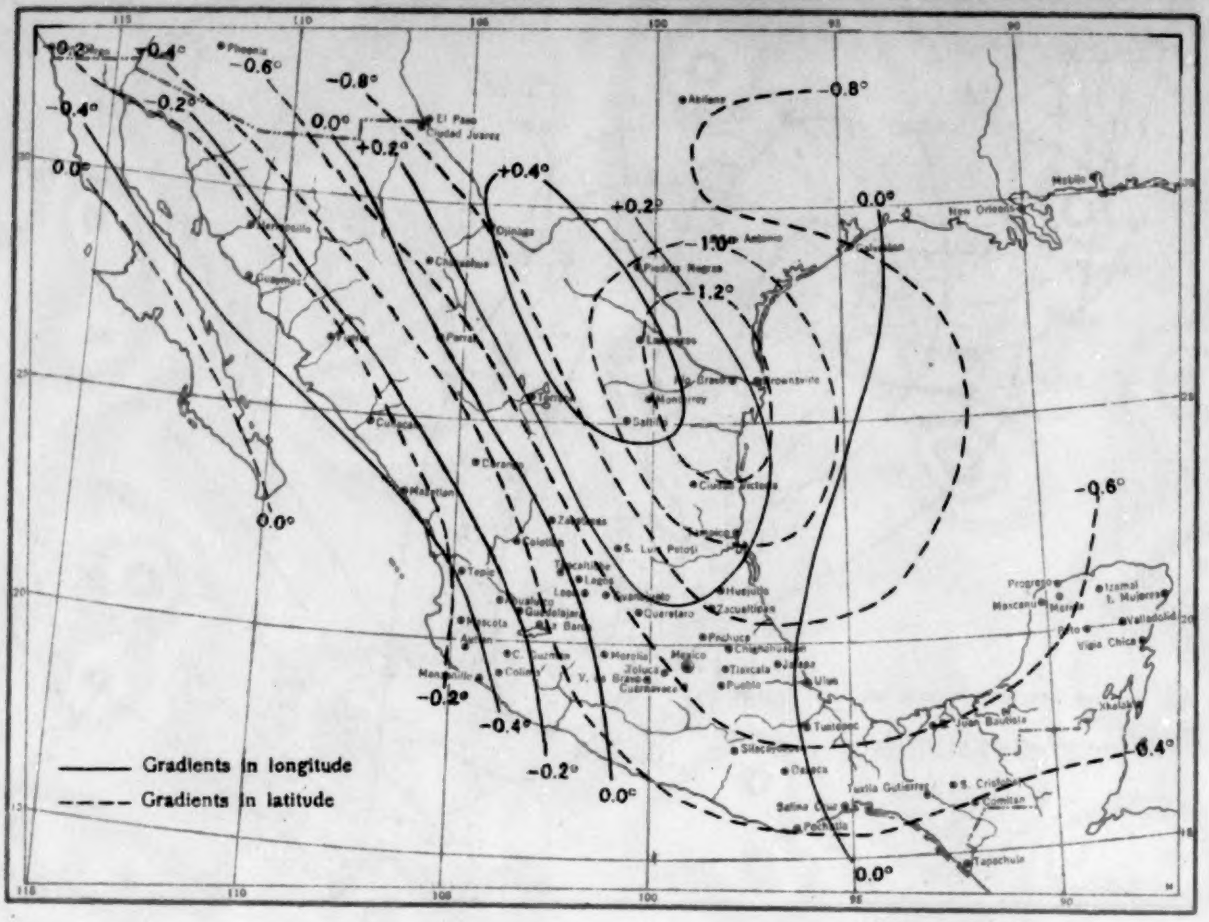


Fig. 53. Temperature gradients in latitude and longitude (°C.), April.

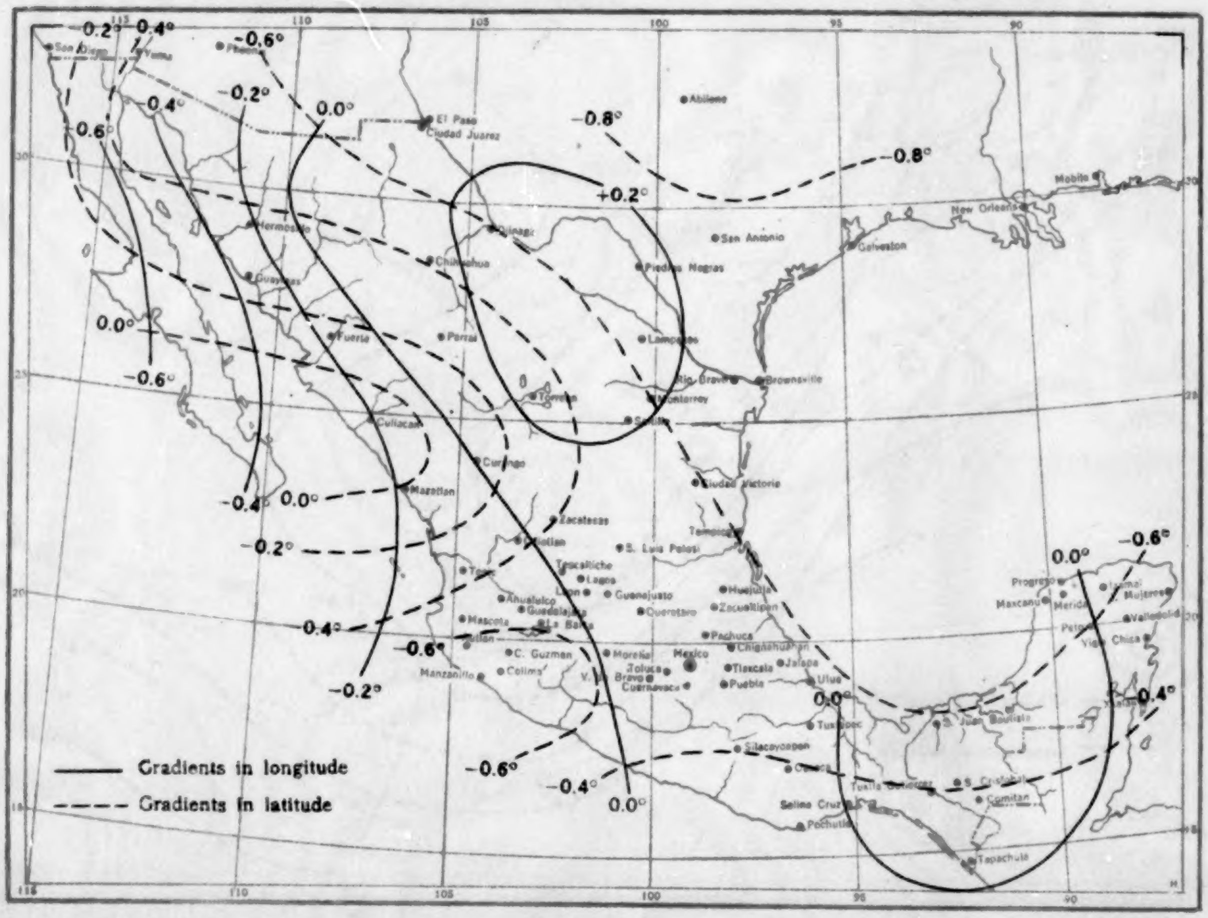


Fig. 54. Temperature gradients in latitude and longitude (°C.), May.

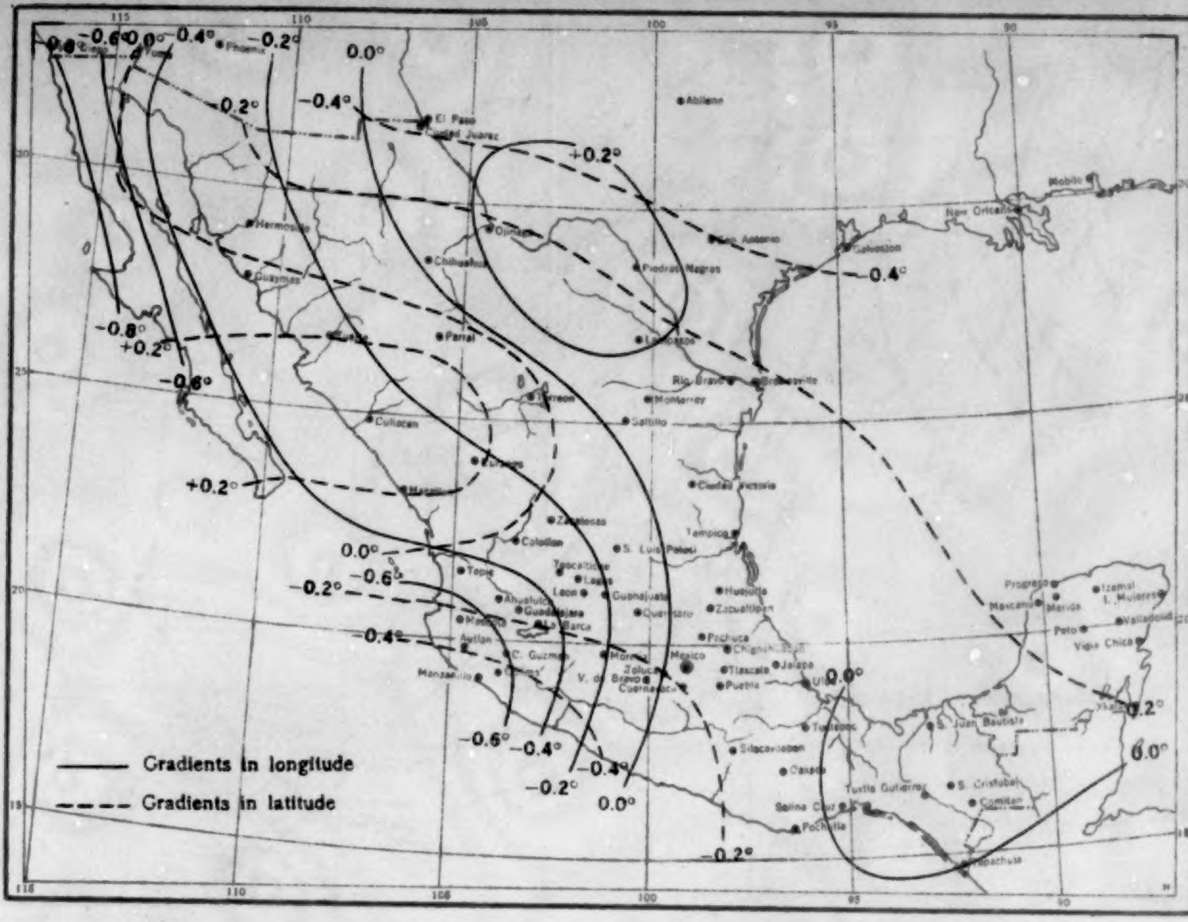


Fig. 55. Temperature gradients in latitude and longitude (°C.), June.

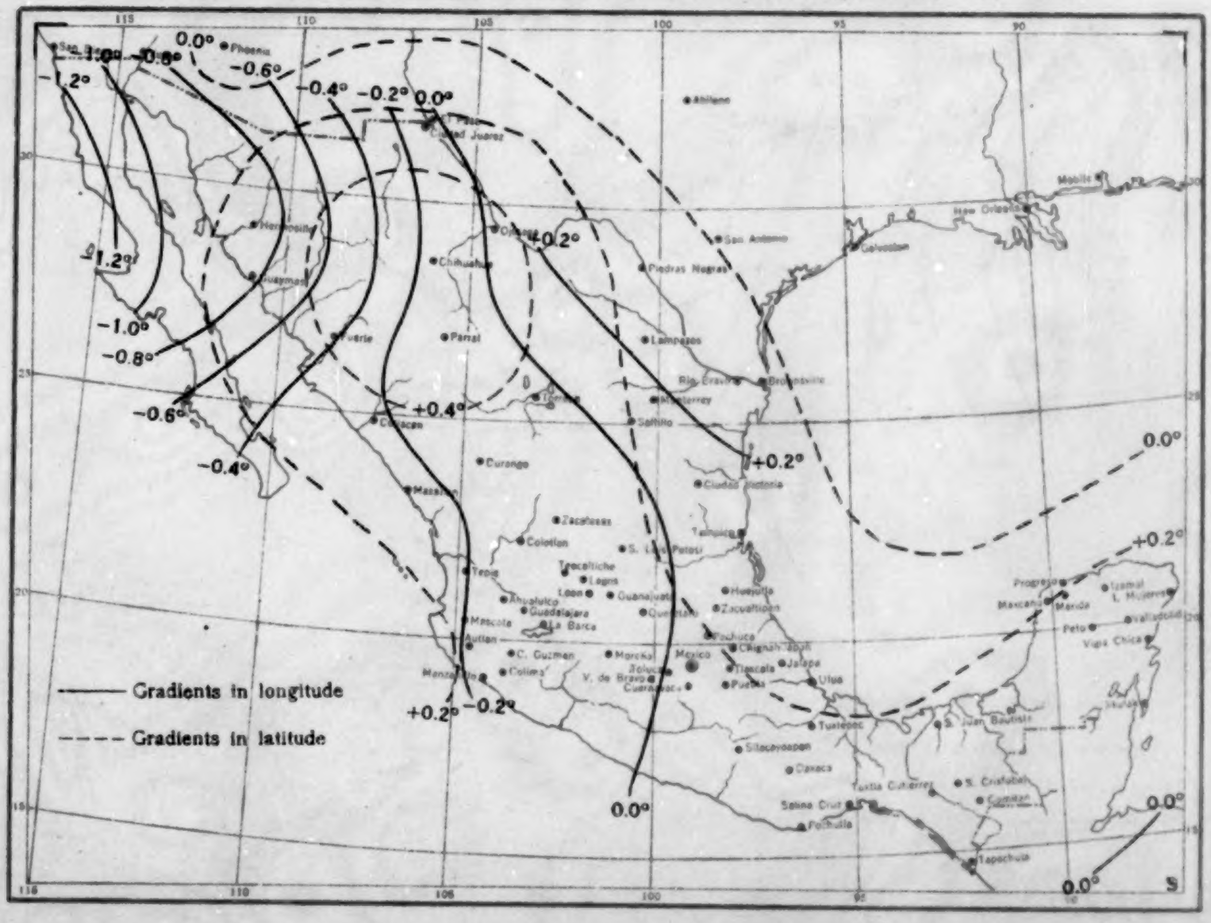


Fig. 56. Temperature gradients in latitude and longitude (°C.), July.

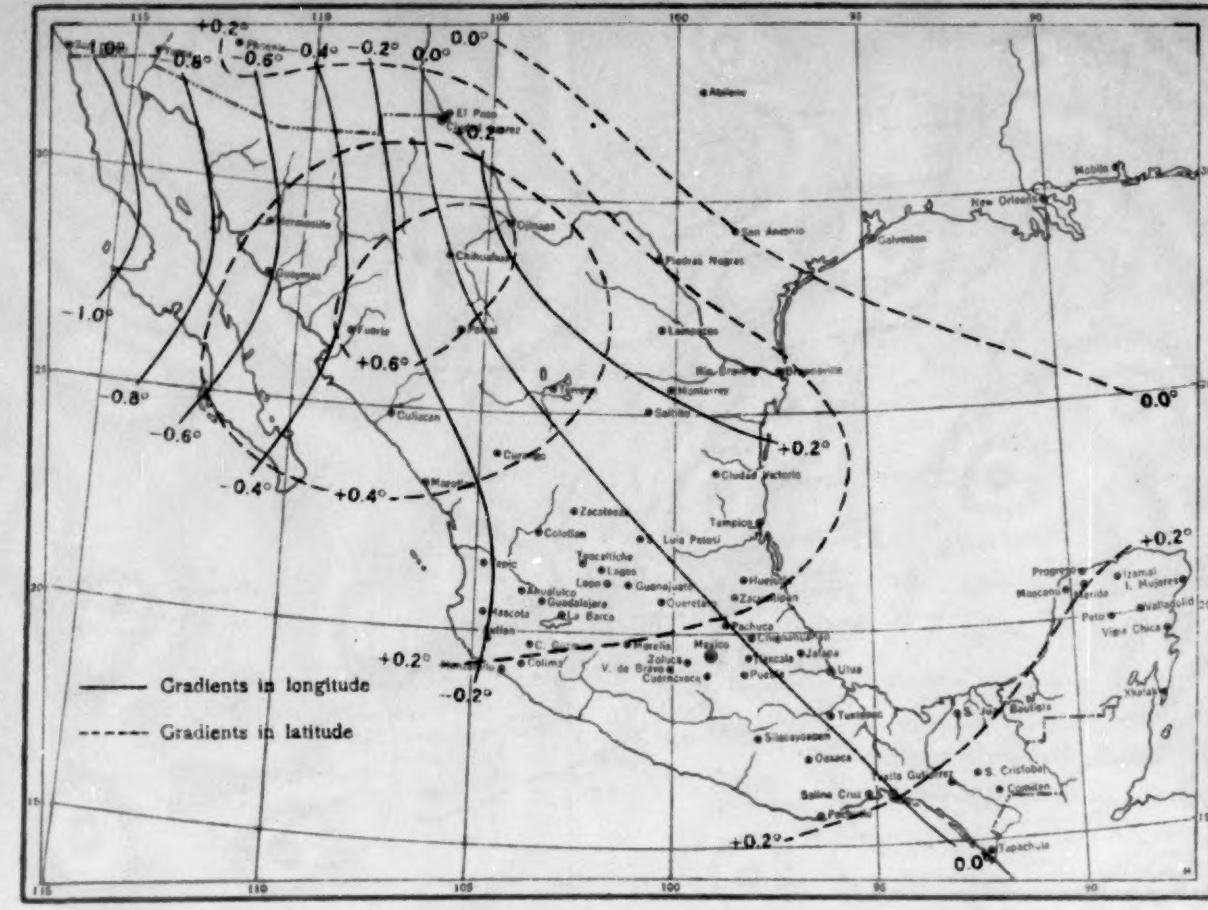


Fig. 57. Temperature gradients in latitude and longitude (°C.), August.

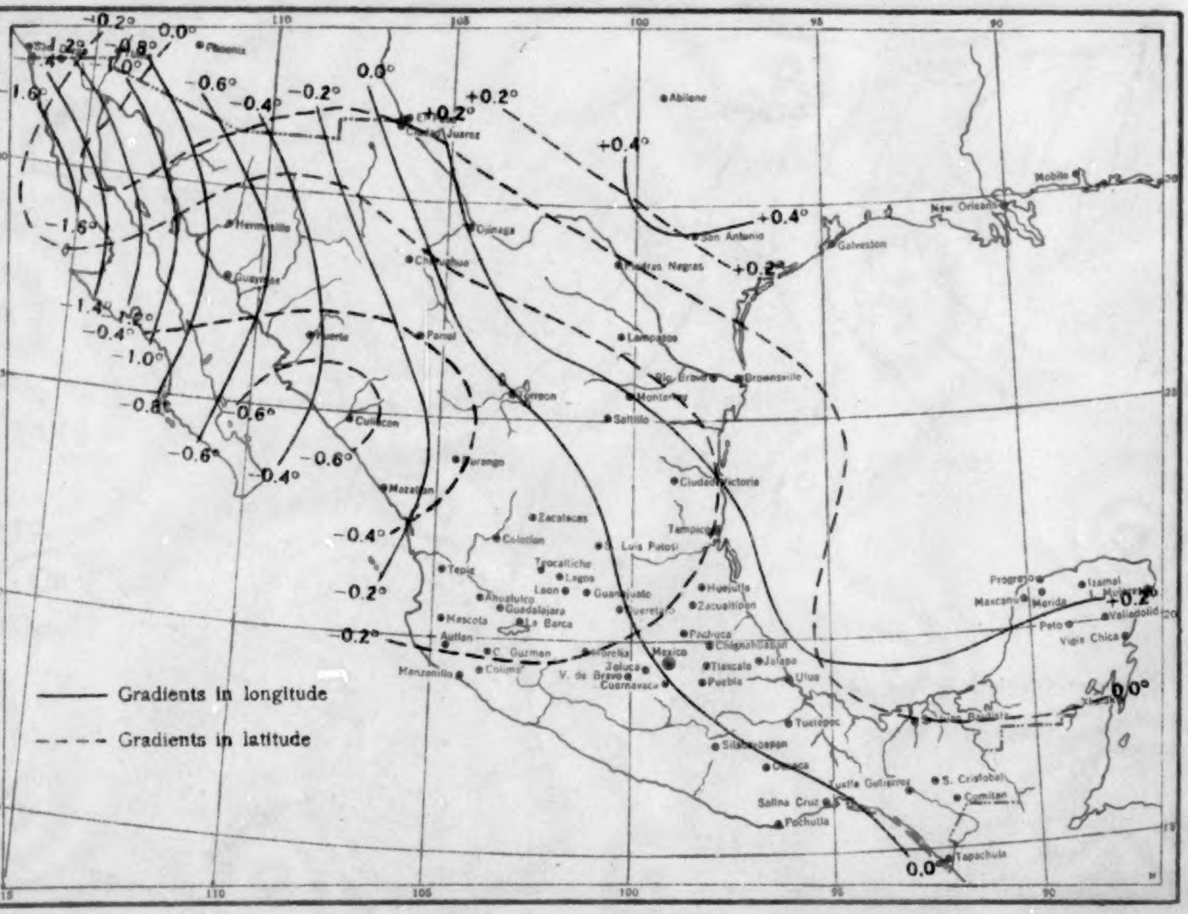


Fig. 58. Temperature gradients in latitude and longitude (°C.), September.

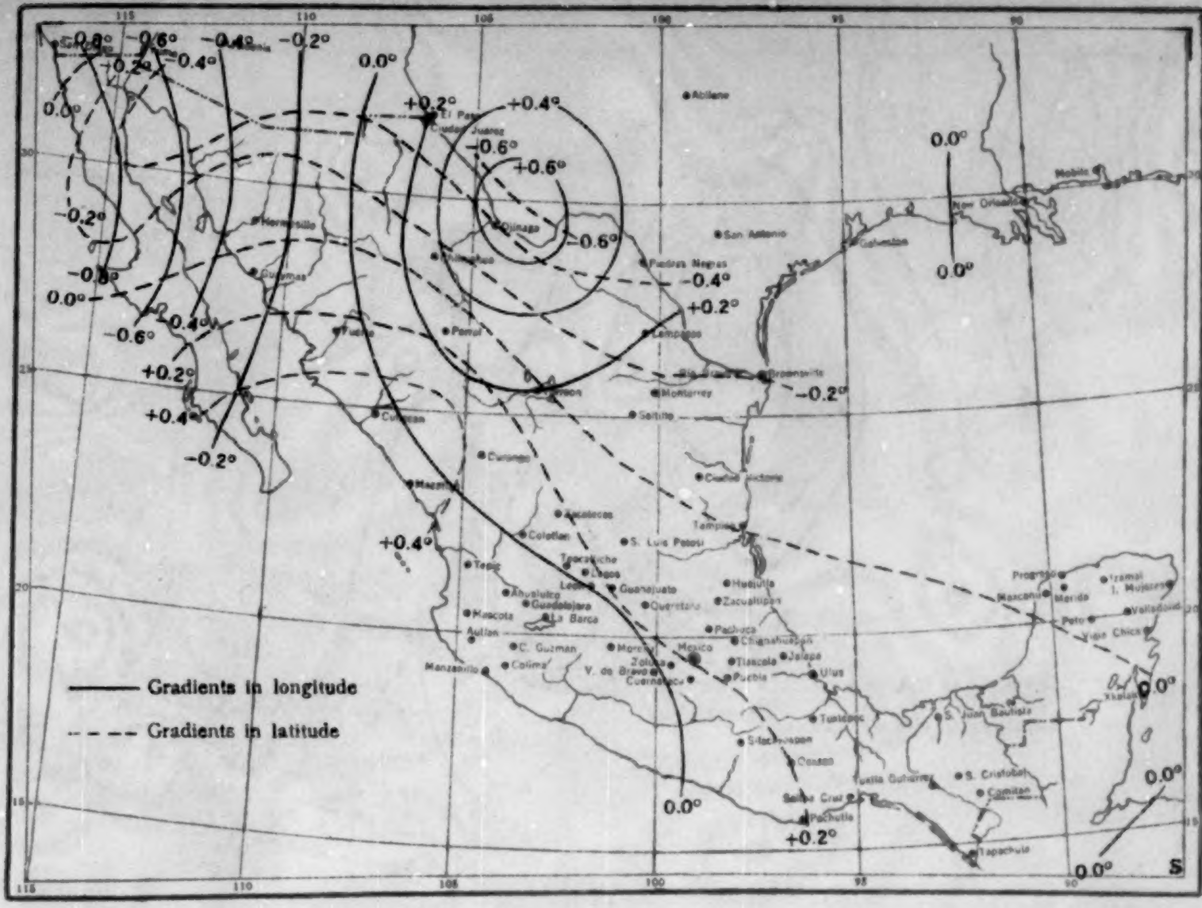


Fig. 59. Temperature gradients in latitude and longitude (°C.), October.

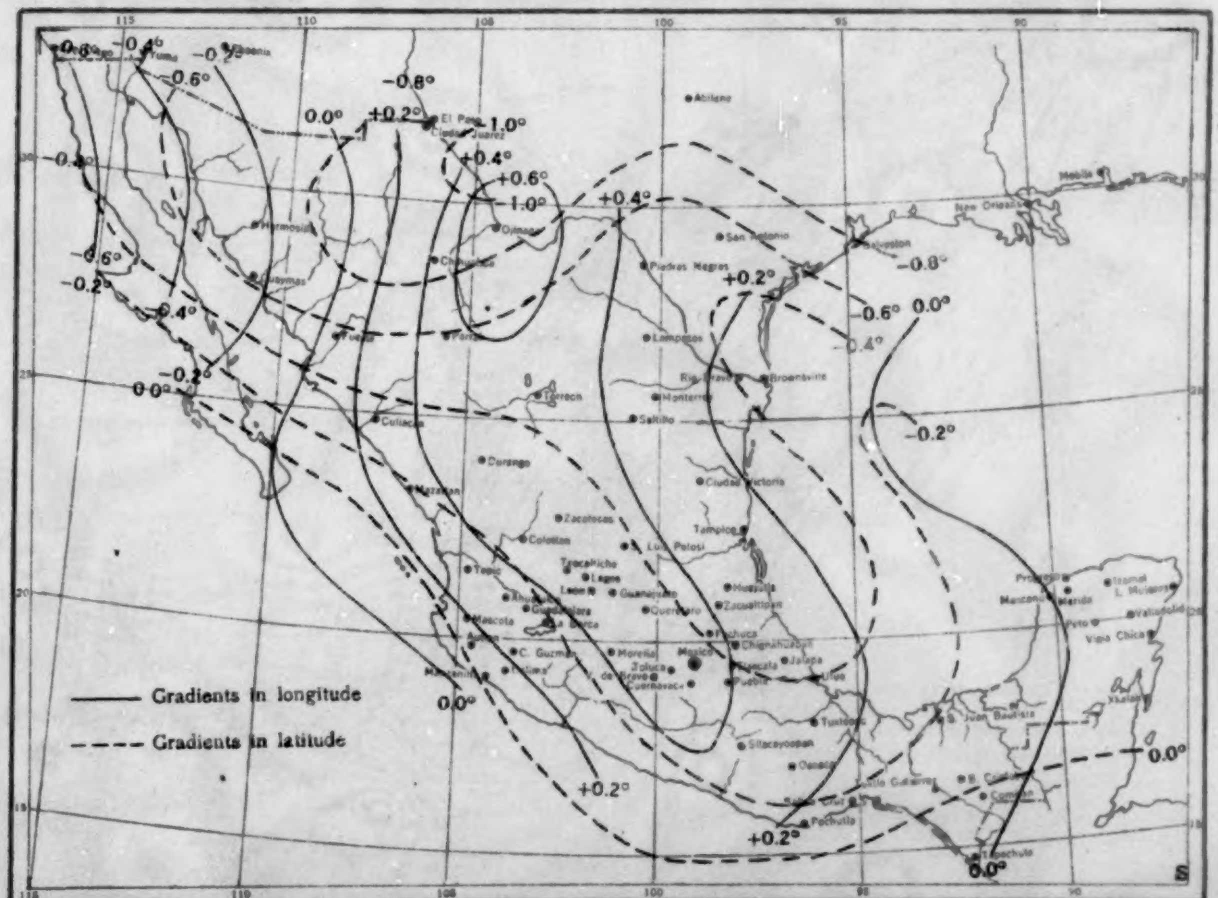


Fig. 60. Temperature gradients in latitude and longitude (°C.), November.

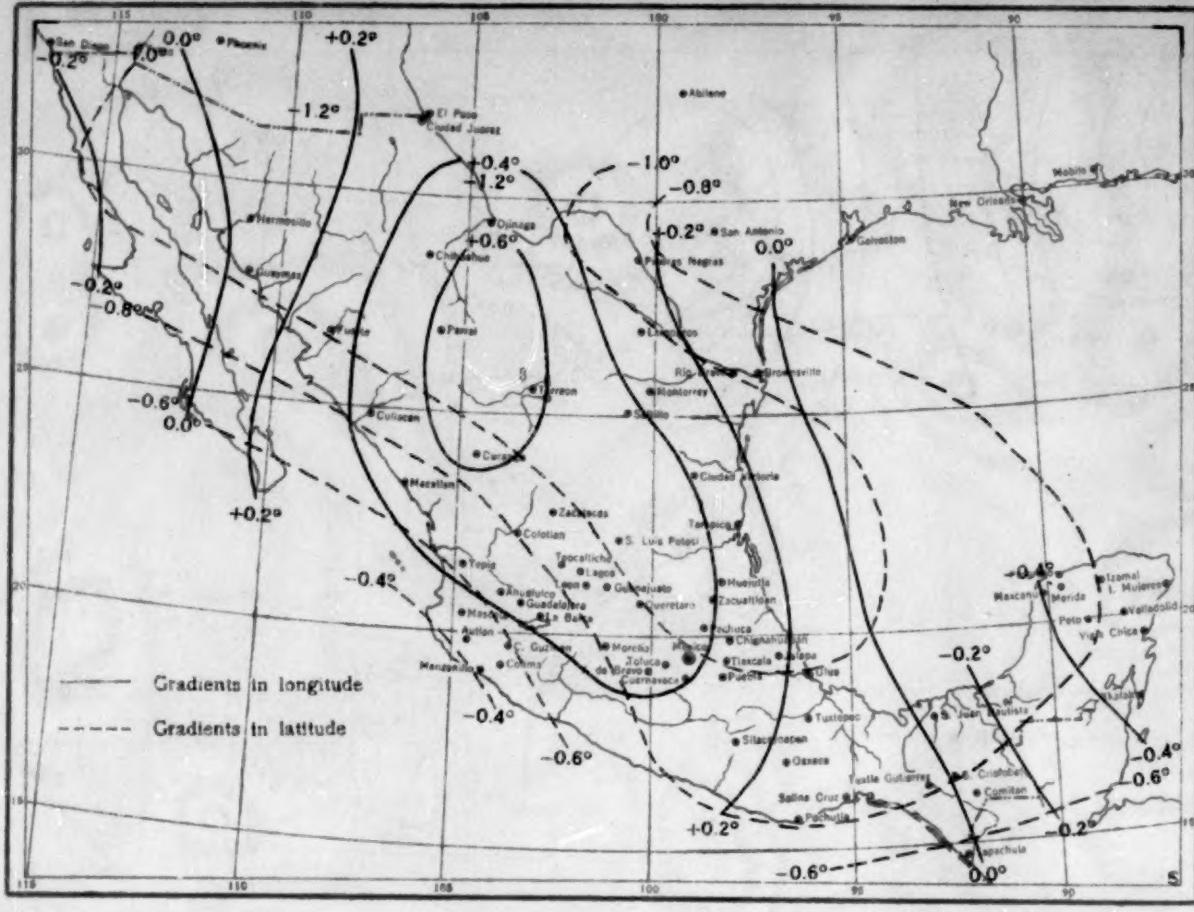


Fig. 61. Temperature gradients in latitude and longitude (°C.), December.

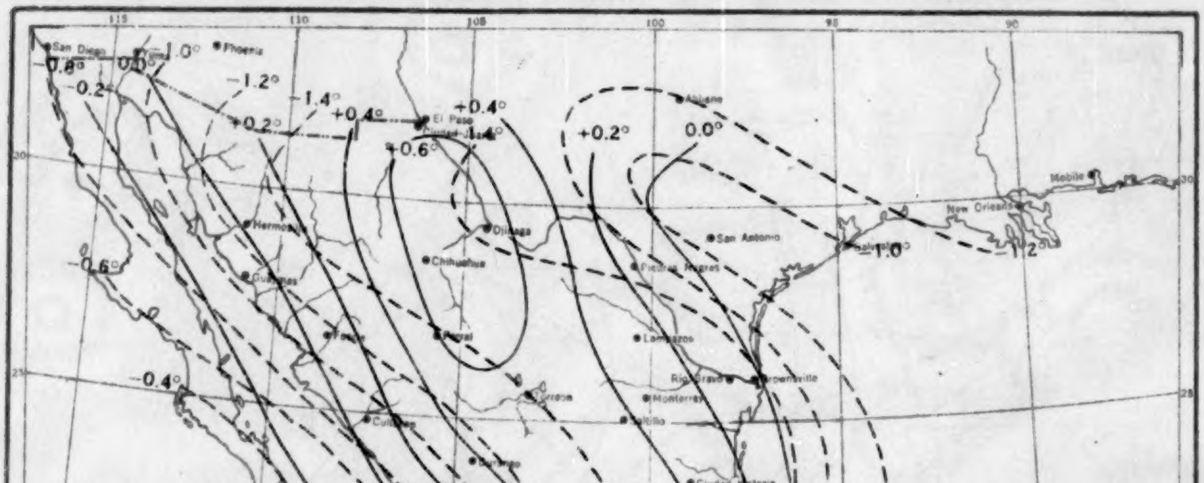
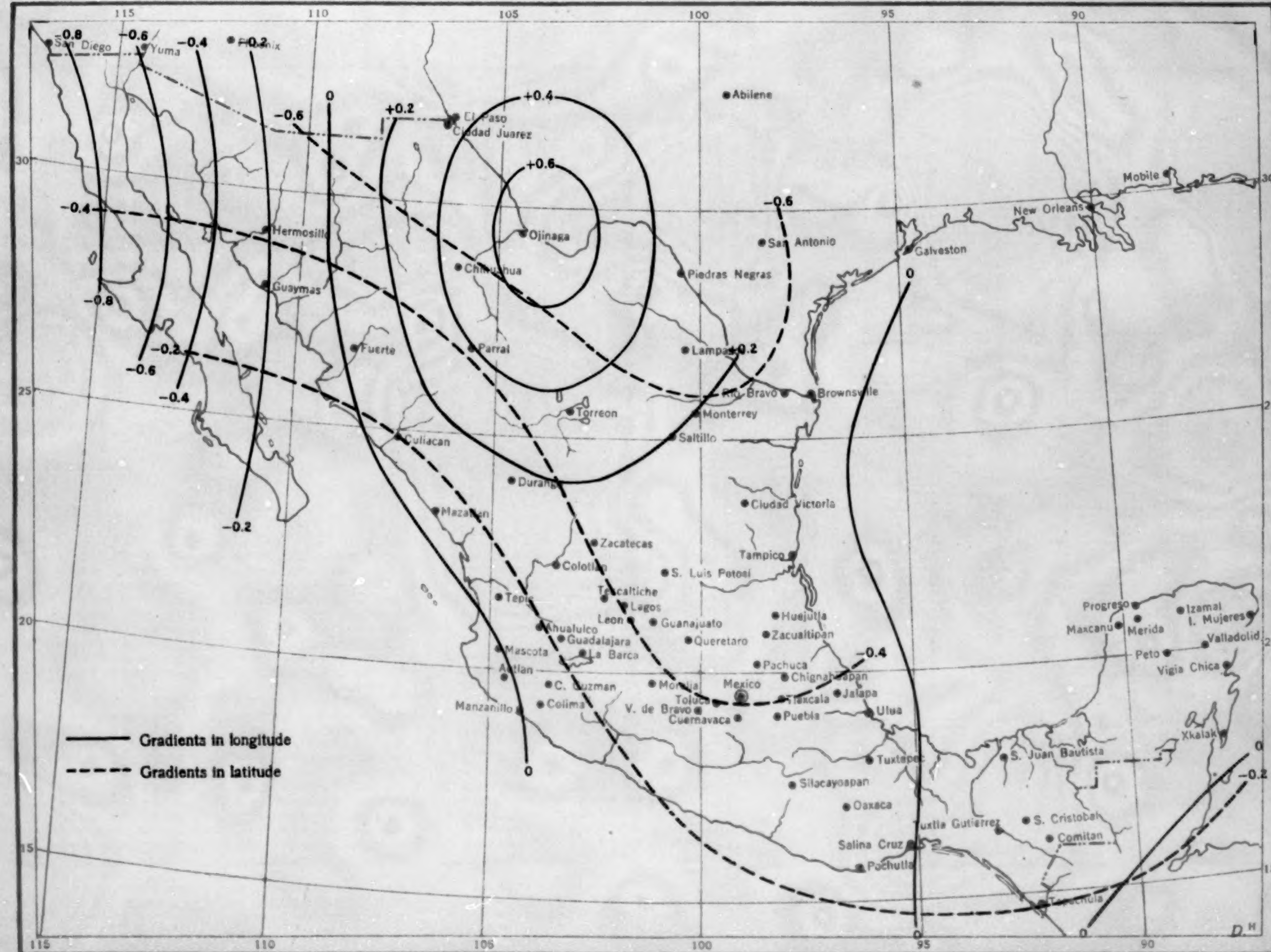


Fig. 62. Temperature gradients in latitude and longitude, Year.



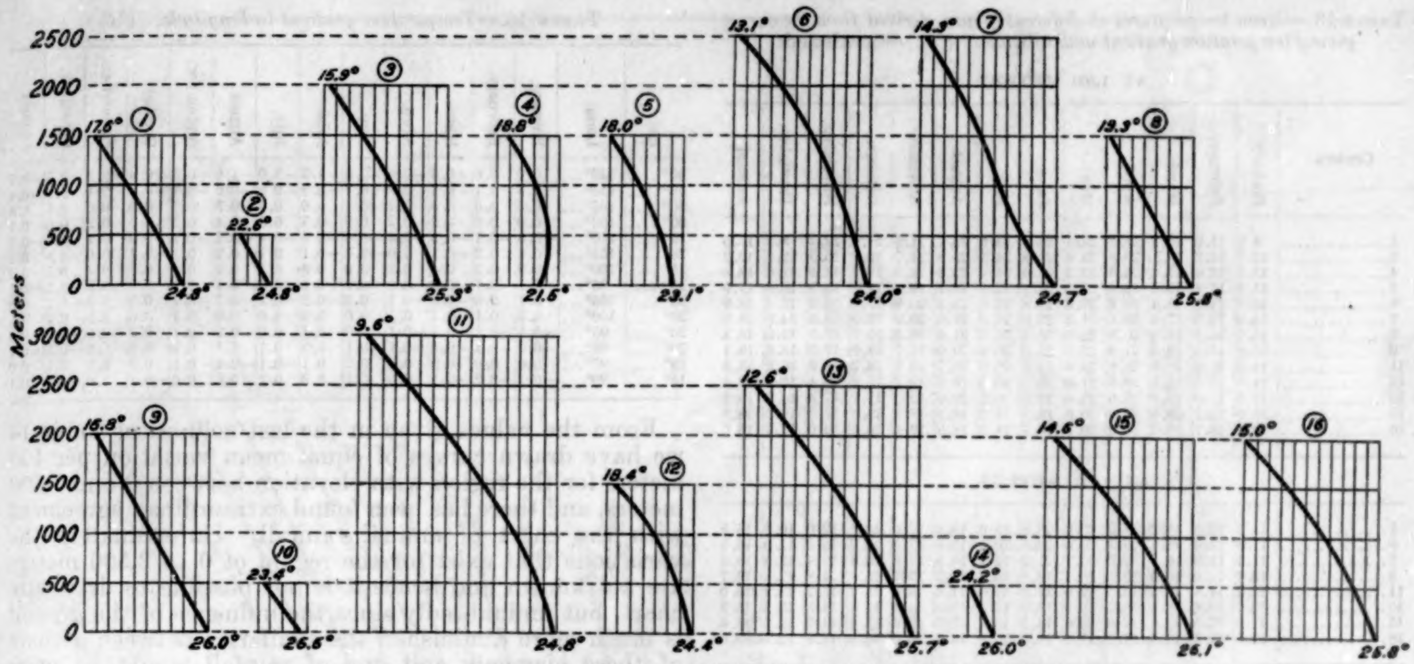


FIG. 49.—Diagram illustrating temperature variations with altitude for each of the 17 districts.

The curves for temperature gradient with elevation that have been obtained for the 17 centers in the country and from which values of t_0 have been deduced appear in Figure 49 and the corresponding numerical values for each month and each center are given in Table 13; namely, for elevations of 0, 500, 1,000, 1,500, 2,000, 2,500, and 3,000 meters.

Finally from these elements there have been deduced values of relative variation of temperature with elevation as shown in Table 14, values of mean variation for 100 meters elevation within each of the different zones to which a range of 500 meters has been assigned, and also for 100 meters in the atmospheric zone from 0 to 1,500 meters.

It would be very tedious to discuss the detailed differences that characterize the series of curves showing variation in temperature with elevation for each of the centers of reduction, and reference will be made only to very special cases.

For example, the inversion of temperature that is observed at center 4 during eight months of the year is interesting. In the zone from 0 to 500 meters the annual variation per 100 meters has the value of 0.1° C. and that for the winter months is even greater. This center corresponds to the arid region of the *Bolson de Mapimi* where the humidity is very low, especially in winter, and according to laws relating to the matter this condition causes the temperature inversion.

At centers 6, 7, 8, and 9 there are observed in the course of the year tendencies toward inversion, manifested in different ways.

The values of temperature variation per 100 meters (Table 14) confirm, in so far as relates to Mexico, facts proven for other regions of the globe. First, the influence of the ground in this variation, causing irregularities of such magnitude that inversions such as are observed at center 4 are recorded; second, outside the zone of the influence that has just been mentioned the variation is successively greater relative to increase in elevation. As a typical case reference may be had to the curves of center 11, where the variation with elevation increases gradually from −0.2° C. per 100 meters in the zone from 0 to 500 meters to −0.7° C. in the zone from 2,500 to 3,000 meters.

TABLE 13.—*Mean temperatures at different planes, derived from the curves giving temperature gradient with altitude.* (°C.)

Centers.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
AT 0 METERS.													
1	18.4	17.4	21.2	23.9	27.0	30.0	31.7	31.2	30.7	27.0	21.6	18.0	24.8
2	19.6	19.8	21.4	23.6	25.9	28.9	29.8	29.6	28.8	26.6	22.2	19.0	24.8
3	20.2	20.2	22.0	24.0	27.0	30.4	29.8	29.4	28.6	27.6	23.6	20.4	25.3
4	12.3	14.0	18.2	22.0	26.6	29.6	29.5	30.0	26.8	21.6	16.3	13.0	21.5
5	15.2	17.0	21.0	23.7	27.4	29.6	29.0	29.0	27.6	23.8	18.8	15.6	23.1
6	17.8	19.0	22.2	24.6	27.2	29.0	28.0	28.4	27.2	24.6	21.7	18.7	24.0
7	21.0	21.2	22.0	23.8	24.8	27.2	27.6	28.0	27.6	27.0	24.5	22.0	24.7
8	23.0	23.2	23.7	25.0	26.8	28.6	28.2	27.8	27.6	27.0	25.4	23.8	25.8
9	23.4	23.0	23.6	24.8	27.6	28.0	28.3	28.2	27.5	27.0	26.0	24.4	25.9
10	24.6	24.8	25.4	27.0	28.0	27.6	27.6	27.6	27.4	21.1	26.2	24.9	26.5
11	20.8	21.2	23.1	25.8	27.2	28.0	27.8	27.6	27.2	24.9	23.0	21.0	24.8
12	20.5	21.0	22.8	25.3	27.2	27.5	27.2	27.0	26.4	24.8	23.0	20.6	24.4
13	22.6	23.9	25.0	27.0	27.5	27.4	27.0	27.3	27.0	25.7	24.2	23.6	25.7
14	22.6	23.7	25.0	26.8	28.3	28.2	27.8	27.7	27.2	26.2	24.9	23.7	26.0
15	23.8	24.6	26.4	27.5	27.6	27.2	26.6	26.4	25.0	26.3	26.0	24.8	26.1
16	23.2	24.3	25.6	26.8	26.8	27.4	26.9	27.3	26.7	25.7	25.1	24.0	25.8
17	21.7	22.8	24.7	26.0	27.0	26.8	26.5	26.6	26.3	25.0	23.6	22.4	25.0
AT 500 METERS.													
1	15.4	16.5	19.8	23.0	26.6	29.2	30.5	29.7	28.6	23.8	18.2	14.6	22.8
2	17.0	17.8	19.8	21.8	24.3	27.2	27.1	27.7	27.7	25.0	18.5	16.4	22.5
3	17.2	18.2	21.3	23.8	26.4	29.0	28.6	28.2	25.0	24.9	20.9	17.1	23.4
4	13.5	15.2	19.5	22.8	26.6	29.2	28.9	29.2	26.8	22.0	17.6	14.6	22.2
5	14.5	16.3	20.1	22.7	26.3	28.2	27.8	27.8	25.7	22.4	17.8	14.6	22.2
6	16.8	17.7	21.4	24.0	26.3	28.0	27.3	27.7	25.6	22.5	19.4	16.2	22.7
7	18.6	18.8	20.0	22.4	23.6	25.0	25.2	25.4	24.6	24.4	22.0	18.8	22.4
8	20.6	21.0	22.6	23.8	25.0	26.2	25.2	25.0	24.6	24.6	22.6	21.4	23.6
9	21.0	21.5	22.6	24.2	25.4	26.2	25.3	24.6	24.4	23.9	22.8	21.6	23.6
10	21.6	21.8	23.0	24.2	25.0	25.6	24.4	24.2	24.0	23.4	22.4	21.3	23.4
11	19.2	20.4	22.8	25.3	25.3	26.2	26.4	26.2	25.7	23.2	21.4	20.2	23.6
12	19.3	20.2	23.0	25.8	27.2	27.4	27.2	26.6	25.8	23.8	21.4	19.4	23.9
13	20.6	21.8	23.4	25.1	25.6	25.7	25.2	25.2	24.9	24.0	22.6	21.5	23.8
14	21.3	22.2	23.6	25.8	27.0	26.0	26.2	25.0	25.0	24.2	22.6	21.4	24.2
15	21.6	22.7	25.2	26.3	26.5	26.1	25.0	24.6	24.2	24.3	23.6	22.8	24.4
16	20.0	22.9	25.4	26.2	26.0	24.9	23.8	23.6	24.0	24.0	24.6	23.0	24.0
AT 1,000 METERS.													
1	12.6	13.8	17.6	21.1	25.1	27.6	28.0	27.0	25.4	20.6	15.0	11.4	20.4
3	14.7	16.2	20.2	22.9	25.4	27.4	27.0	26.6	24.8	22.0	18.0	14.6	21.6
4	13.2	15.0	19.2	22.2	25.4	27.7	27.1	27.2	25.2	21.1	17.0	14.0	21.2
5	13.2	15.0	18.6	21.4	24.6	26.4	25.7	25.6	25.4	20.2	16.2	13.0	20.4
6	15.5	16.2	20.0	22.8	24.8	26.3	25.5	26.2	23.6	20.2	17.4	14.2	21.1
7	16.2	16.8	19.0	21.4	23.0	23.5	23.7	23.3	22.2	21.7	19.3	16.2	20.5
8	18.3	18.8	20.6	22.2	23.4	24.4	23.0	22.5	22.3	22.2	19.8	18.2	21.3
9	18.6	19.4	21.0	22.7	23.9	24.6	22.6	22.0	22.0	21.3	19.8	18.6	21.4
11	17.2	19.0	21.2	23.8	24.1	23.6	23.4	23.3	23.0	20.9	19.3	18.6	21.5
12	17.0	18.5	21.3	24.0	25.0	24.8	24.6	24.0	23.4	21.3	19.2	17.8	21.7
13	17.0	19.6	21.4	23.0	23.4	23.4	23.0	22.7	22.2	21.6	20.2	18.9	21.4
15	18.8	20.0	22.2	23.7	23.8	23.4	21.7	21.6	21.2	21.6	20.8	19.5	21.5
16	19.5	20.2	23.1	24.0	23.8	22.4	21.2	21.1	21.8	21.8	22.2	20.8	21.8

TABLE 13.—*Mean temperatures at different places, derived from the curves giving temperature gradient with altitude.* (°C.)—Continued.

AT 1,500 METERS.

Centers.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
1	9.6	11.0	14.8	18.8	23.4	25.6	24.6	23.2	21.5	17.5	12.2	8.2	17.5
3	12.7	14.2	18.1	20.8	23.4	24.8	24.3	23.8	21.7	19.0	15.3	12.5	19.2
4	12.2	13.6	17.4	20.4	23.2	25.0	24.4	23.8	21.6	18.2	14.8	11.6	18.8
5	11.4	13.4	16.8	19.4	22.5	24.3	22.9	22.7	19.8	17.0	13.8	10.6	17.9
6	13.9	14.4	18.4	20.9	22.6	23.8	23.0	23.5	20.9	17.8	15.2	12.4	18.9
7	14.0	14.8	17.8	20.6	21.2	22.6	21.8	21.0	20.0	19.0	16.6	14.0	19.0
8	15.2	16.4	18.4	20.8	22.0	23.4	22.2	21.6	20.5	19.7	17.1	14.5	19.3
9	15.6	17.0	19.0	21.0	22.3	22.5	20.6	20.0	19.7	18.9	17.3	15.8	19.1
11	14.8	16.9	19.0	21.6	21.6	20.8	20.0	20.7	19.8	18.2	16.6	16.0	18.8
12	14.0	16.0	18.6	20.8	21.0	20.5	20.0	19.8	19.7	18.2	16.4	15.6	18.4
13	15.2	17.0	19.2	20.6	21.0	20.8	20.2	19.9	19.4	18.7	17.4	15.9	18.8
15	15.6	16.7	18.6	20.2	20.6	19.8	18.5	18.3	18.2	18.6	17.7	16.3	18.3
16	16.1	16.7	19.3	21.0	20.8	19.7	18.8	18.8	19.4	19.3	19.0	17.4	18.6
AT 2,000 METERS.													
3	11.0	12.3	15.2	17.2	20.0	20.6	19.6	18.8	17.6	15.6	12.6	10.8	15.9
6	11.9	14.4	16.1	18.7	20.0	20.5	19.0	19.4	17.4	15.2	13.2	11.0	16.4
7	11.4	13.0	16.5	19.3	20.7	21.2	19.4	18.8	17.6	16.4	13.4	11.8	16.6
9	12.4	14.0	16.6	19.0	20.1	19.7	18.4	18.2	17.7	16.6	14.8	12.8	16.7
11	12.2	14.4	16.4	19.0	19.0	17.8	17.0	17.6	16.6	15.4	13.7	12.8	16.0
13	12.1	14.0	16.6	18.2	18.4	18.0	17.4	17.0	16.2	15.5	14.3	12.8	15.9
15	11.8	12.8	14.4	16.0	16.6	16.3	15.4	15.0	15.0	15.4	14.2	12.5	14.6
16	12.1	12.6	14.6	17.2	17.0	17.0	16.0	15.4	16.0	15.8	14.6	12.7	15.0
AT 2,500 METERS.													
6	9.4	9.8	13.2	16.2	17.0	16.6	14.0	14.0	13.3	12.4	10.8	10.0	13.1
7	9.6	11.0	13.8	16.6	17.8	17.6	16.0	16.0	15.4	13.6	10.0	10.0	14.3
11	9.2	11.1	13.4	15.8	15.8	14.8	13.7	14.3	13.2	12.2	10.6	9.2	12.8
13	9.0	10.6	14.0	14.7	15.4	14.8	14.2	14.0	12.8	12.0	10.8	9.2	12.6
AT 3,000 METERS.													
11	6.2	7.6	10.0	12.3	12.4	12.0	10.6	11.2	9.8	9.0	7.4	5.8	9.5

TABLE 14.—*Vertical temperature gradient (°C.). Mean values per 100 meters.*

Centers.	Zones (in meters).						
	0 to 500.	500 to 1,000.	1,000 to 1,500.	1,500 to 2,000.	2,000 to 2,500.	2,500 to 3,000.	0 to 1,500.
1	−0.4	−0.5	−0.6				−0.5
2	−0.5						
3	−0.4	−0.4	−0.5	−0.5			−0.4
4	0.1	−0.2	−0.5				−0.2
5	−0.2	−0.4	−0.5				−0.4
6	−0.3	−0.3	−0.4	−0.5	−0.6		−0.3
7	−0.5	−0.4	−0.3	−0.5	−0.5		−0.4
8	−0.4	−0.5	−0.4				−0.4
9	−0.5	−0.4	−0.4	−0.5			−0.4
10	−0.6						
11	−0.2	−0.4	−0.5	−0.6	−0.6	−0.7	−0.4
12	−0.1	−0.4	−0.6				−0.4
13	−0.4	−0.5	−0.5	−0.6	−0.7		−0.5
14	−0.4						
15	−0.3	−0.6	−0.6	−0.7			−0.5
16	−0.4	−0.4	−0.6	−0.7			−0.5

TABLE 15.—*Temperature gradient in latitude.* (°C.)

Lat.	Long.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
30°	115°	−1.3	−0.8	0.0	−0.4	0.0	0.1	0.2	0.0	−0.5	−0.5	−1.1	−0.8	−0.5
30°	110°	−1.6	−1.1	−0.4	−0.4	−0.2	0.4	0.5	0.2	−0.1	−0.8	−1.3	−1.5	−0.5
30°	105°	−0.9	−1.2	−0.8	−0.6	−0.2	0.5	0.6	0.1	−0.6	−1.0	−1.2	−1.3	−0.7
30°	100°	−0.9	−1.1	−0.4	−0.7	−0.4	0.1	0.0	−0.2	−0.3	−0.5	−0.8	−0.9	−0.6
25°	110°	−0.3	−0.6	0.0	0.1	0.3	0.2	0.5	0.6	0.5	0.0	−0.7	−0.4	−0.1
25°	105°	−0.6	−1.0	−0.3	−0.1	0.3	0.4	0.4	0.5	0.4	−0.3	−1.0	−1.1	−0.2
25°	100°	−1.6	−1.0	−1.4	−0.6	−0.2	0.1	0.3	0.3	−0.1	−0.5	−1.0	−1.5	−0.5
25°	95°	−1.3	−0.9	−1.0	−0.7	−0.2	0.0	0.2	0.3	−0.1	−0.2	−0.9	−1.3	−0.5
20°	105°	−0.4	−0.4	−0.2	−0.7	−0.3	0.2	0.2	0.2	0.2	0.0	−0.4	−0.6	−0.3
20°	100°	−1.3	−1.0	−0.6	−0.5	−0.2	0.2	0.2	0.2	0.2	−0.2	−1.0	−1.3	−0.4
20°	95°	−1.0	−0.8	−0.7	−0.6	−0.2	0.0	0.1	0.0	0.1	−0.5	−1.0	−1.3	−0.3
20°	90°	−0.6	−0.3	−0.6	−0.6	−0.3	0.3	0.3	−0.1	0.0	0.0	−0.9	−0.7	−0.3
15°	95°	−0.4	−0.2	−0.3	−0.2	−0.1	0.3	0.4	0.2	0.1	0.1	−0.5	−0.3	−0.2
15°	90°	−0.4	−0.2	−0.3	−0.2	−0.1	0.2	0.3	0.2	0.1	0.1	−0.5	−0.3	−0.2

TABLE 16.—*Temperature gradient in longitude.* (°C.)

Lat.	Long.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual.
30°	115°	0.0	0.0	−0.5	−0.6	−0.8	−1.3	−1.0	−1.6	−0.9	−0.6	−0.2	−0.3	−0.8
30°	110°	0.5	0.1	−0.1	0.0	−0.1	−0.8	−0.9	−0.6	−0.1	−0.2	0.1	0.2	−0.1
30°	105°	0.5	0.3	0.5	0.3	0.1	0.0	0.3	0.3	0.7	0.8	0.6	0.6	0.6
30°	100°	0.0	0.0	0.2	0.2	0.2	0.3	0.3	0.4	0.2	0.3	0.2	0.0	0.2
25°	110°	0.3	−0.1	−0.5	−0.4	−0.4	−0.3	−0.4	−0.5	−0.1	0.0	0.2	−0.3	−0.2
25°	105°	0.6	0.2	−0.1	0.0	−0.1	−0.1	0.1	0.2	0.1	0.4	0.6	0.5	0.2
25°	100°	0.2	0.2	0.4	0.2	0.0	0.0	0.1	0.2	0.1	0.3	0.4	0.3	0.2
25°	95°	−0.1	−0.1	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.0	−0.2	−0.2	−0.1
20°	105°	0.1	0.0	−0.5	−0.1	−0.8	−0.2	−0.2	−0.1	−0.1	0.0	0.2	−0.2	0.0
20°	100°	0.3	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.5	0.5	0.7	0.1
20°	95°	−0.1	−0.1	−0.1	−0.1	0.0	0.1	0.0	0.2	0.1	0.2	0.0	−0.2	0.0
20°	90°	−0.2	−0.1	−0.1	−0.1	−0.1	0.1	0.1	0.1	0.1	0.0	−0.4	−0.2	−0.1
15°	95°	0.0	0.0	0.0	0.0	0.0	0.1	−0.1	−0.1	0.1	0.1	0.1	0.1	0.0
15°	90°	−0.1	−0.2	−0.1	0.0	0.1	0.0	0.1	0.1	0.0	−0.1	0.0	−0.1	−0.1

From the values given in the last column of Table 14 we have drawn curves of equal mean variation per 100 meters for the region with elevation between 0 and 1,500 meters, and there has been found extraordinay agreement with the chart of annual rainfall. Unfortunately the variations that exist for the region of 0 to 2,500 meters are not known and hence it is not possible to draw any chart, but undoubtedly since the influence of the ground is much more diminished the similarity between a chart of these elements and one of rainfall would be more complete. The minimum value of the mean variations per 100 meters in the regions from 0 to 1,500 meters is found, as is seen, to be −0.2° C. in the State of Coahuila; and the maximum, −0.5° C. on all of the Pacific slope. In this connection it appears that latitude, too, has influence, but through lack of elements necessary to extend the scope of investigation we are not permitted to assert it at present and much less to speak of the importance of the relation. The increase in variation in temperature with elevation is found to be most rapid in the southeastern part of the country; this appears plainly from the paths of the curves in that region.

From the temperature situation at sea level we have derived the gradients for latitude and longitude that appear in Tables 15 and 16, which give the values obtained for the points whose geographical coordinates are indicated. Charts have been constructed from these values and are reproduced as Figures 50–62.

The sea-level distribution of temperature is shown by the charts which have been reproduced as Figures 63–75.

By reference to the tables and charts relating to the distribution of sea-level temperature and to the values of temperature gradient for latitude and longitude related to the same perfect account may be given of the annual march of those elements so necessary to the general study of the atmosphere.

EDITOR'S NOTE.—The Weather Bureau welcomes this contribution as a valuable addition to current knowledge of temperature conditions on the North American Continent. With the Canadian Meteorological Service on the North pushing its outposts nearer and nearer to the Arctic Circle the time can not be long delayed when a fairly homogenous system of temperature observations will be available for the continent from the Equator to the Arctic Circle.

The editor feels that no apology is necessary for reproducing the tables and charts of the memoir in the centigrade scale, as in the original. As a concession to those who may not be familiar with that scale, the corresponding values in the Fahrenheit scale have been given in the text where it seemed necessary and the Fahrenheit temperatures have been affixed to the right margin of the isothermal charts. Our sincere thanks are due to the author for this important and valuable memoir.

Fig. 63. Sea-level isotherms, January.

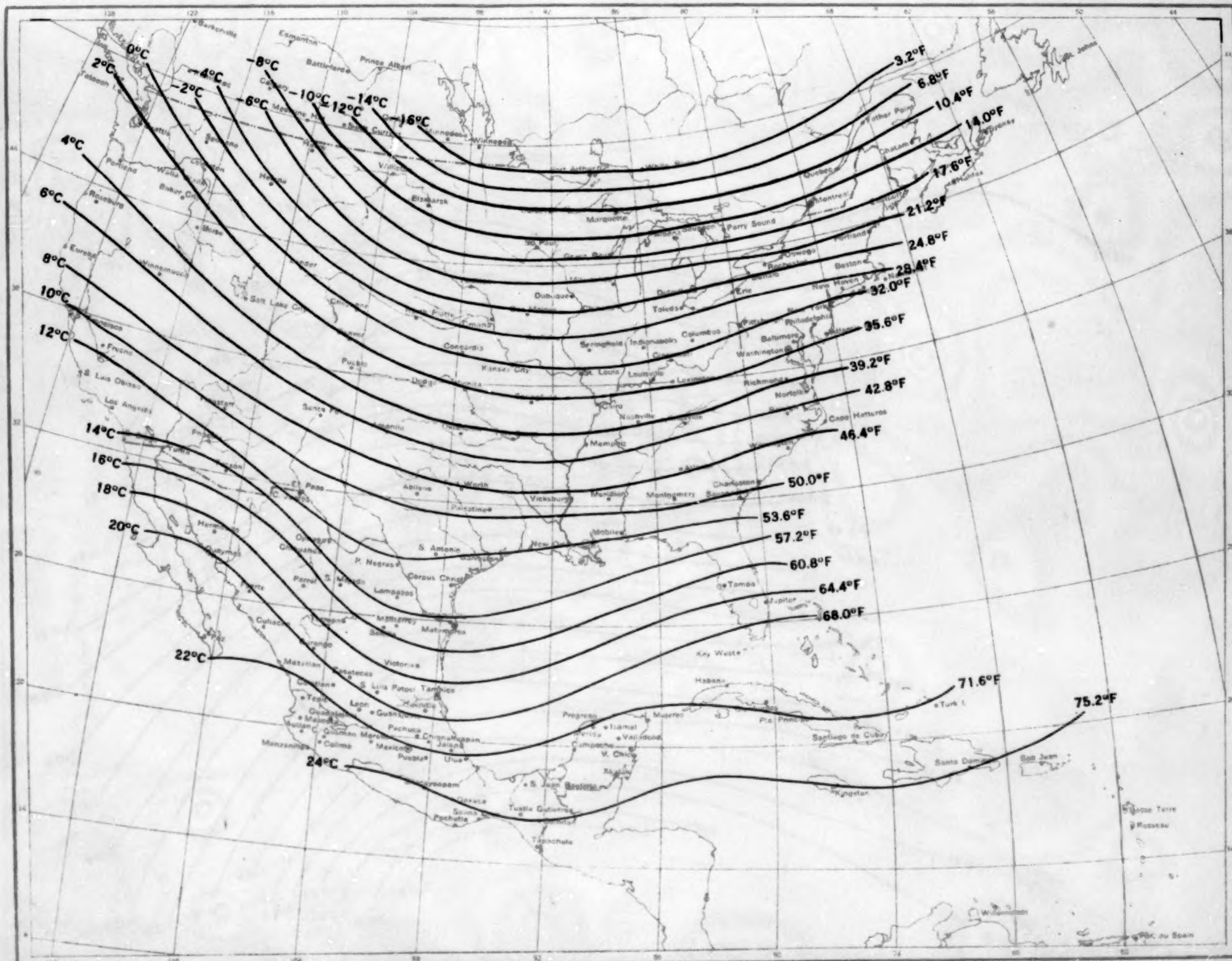


Fig. 64. Sea-level isotherms, February.

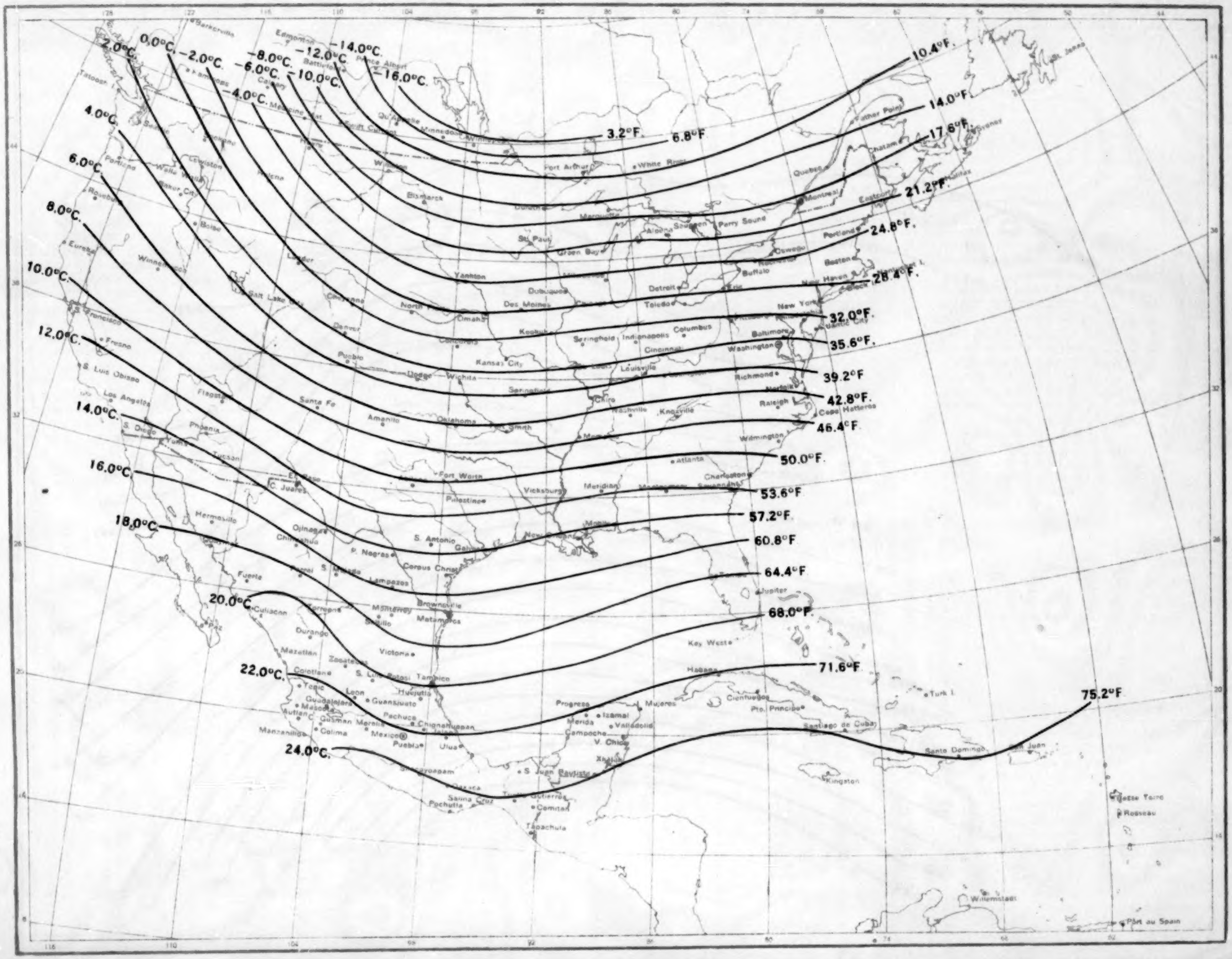


Fig. 65. Sea-level isotherms, March.

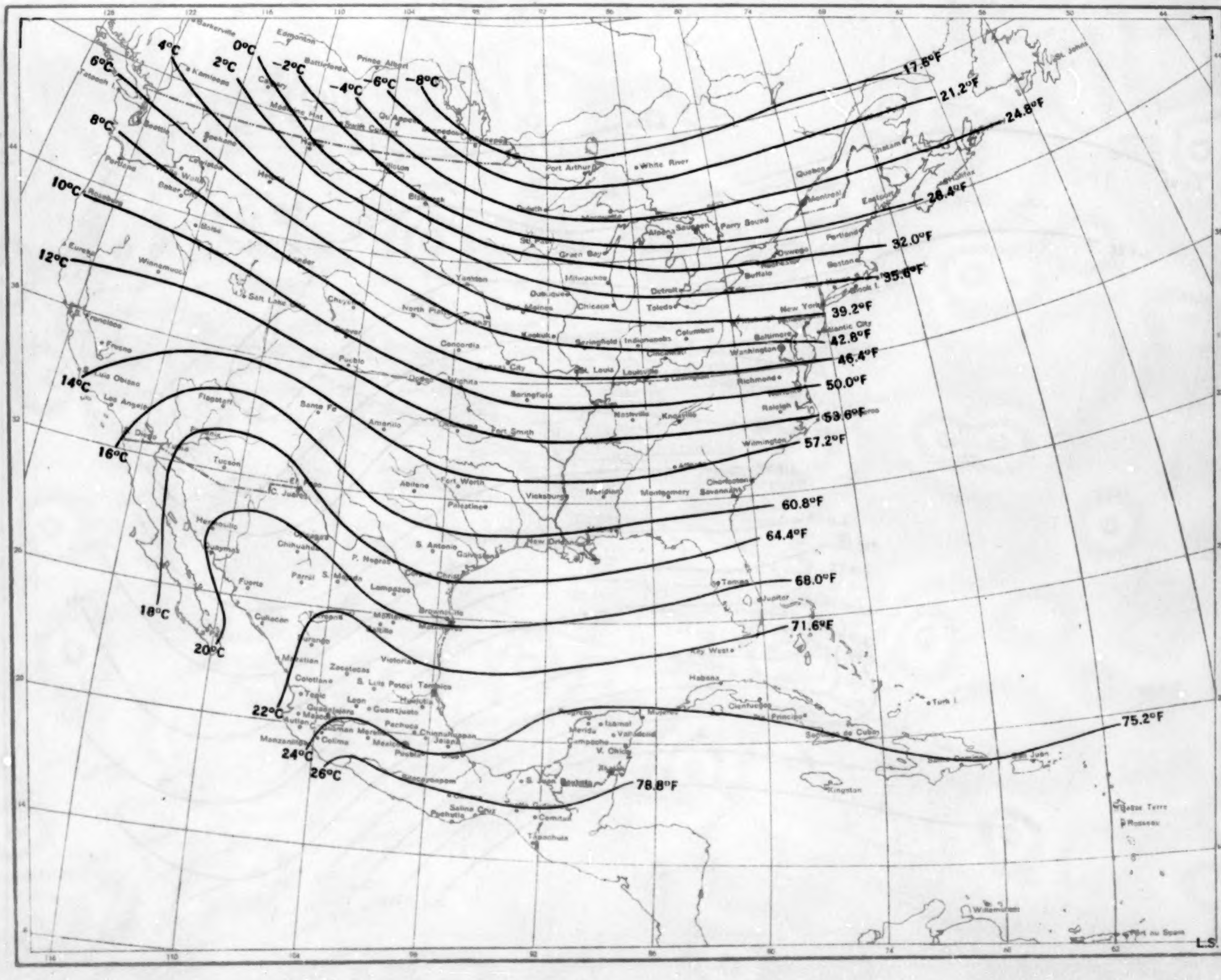


Fig. 66. Sea-level isotherms, April.

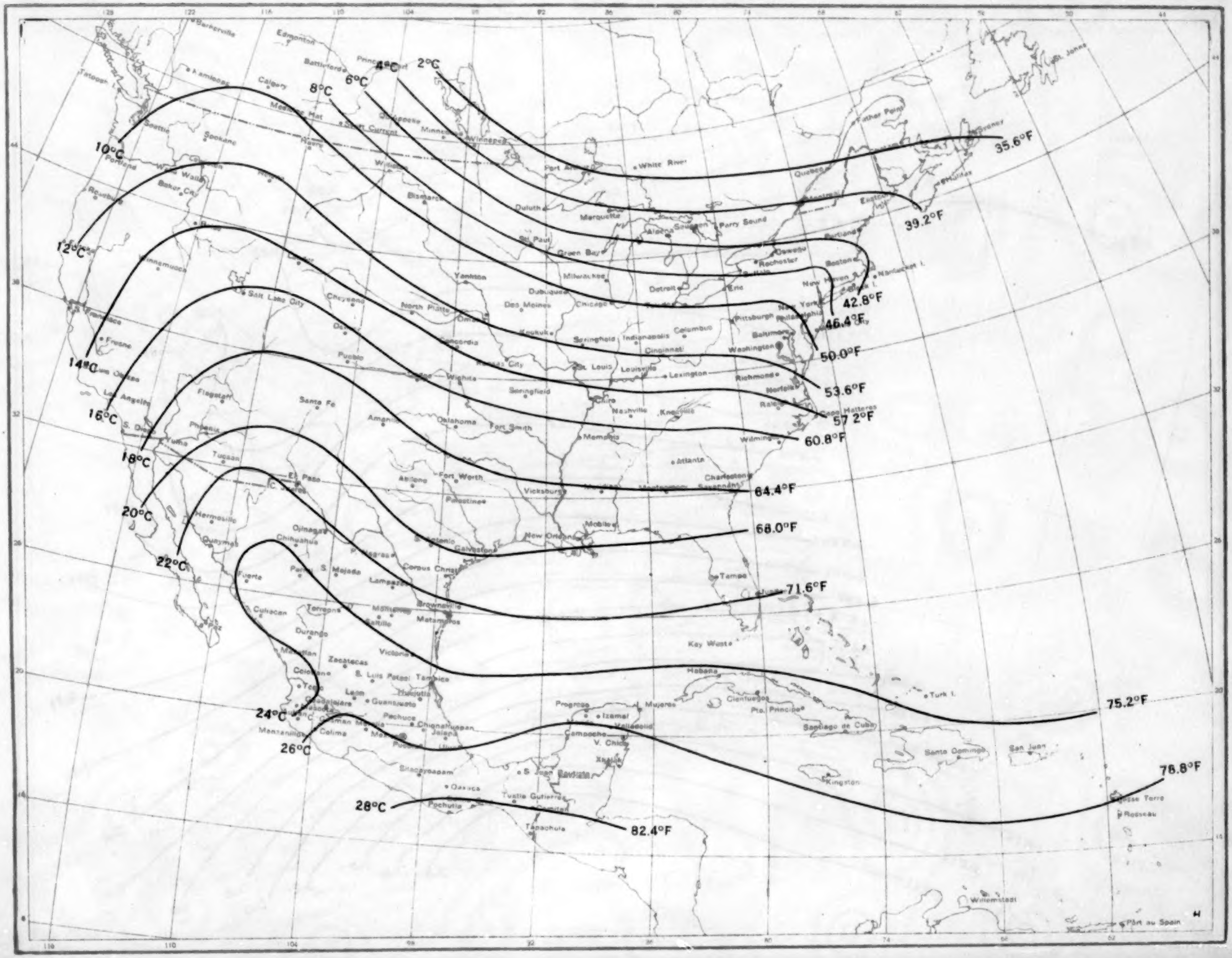


Fig. 67. Sea-level isotherms, May.

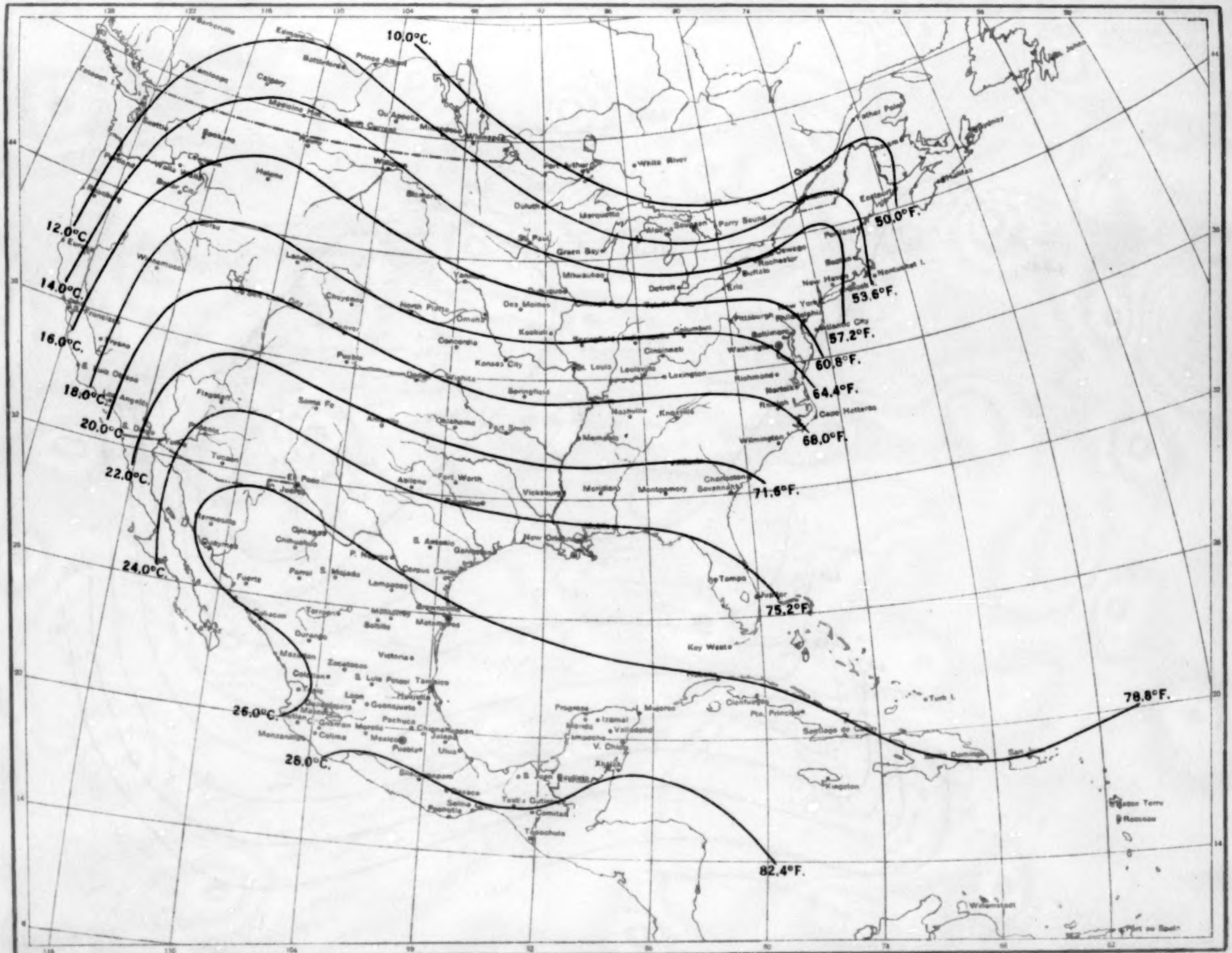


Fig. 68. Sea-level isotherms, June.

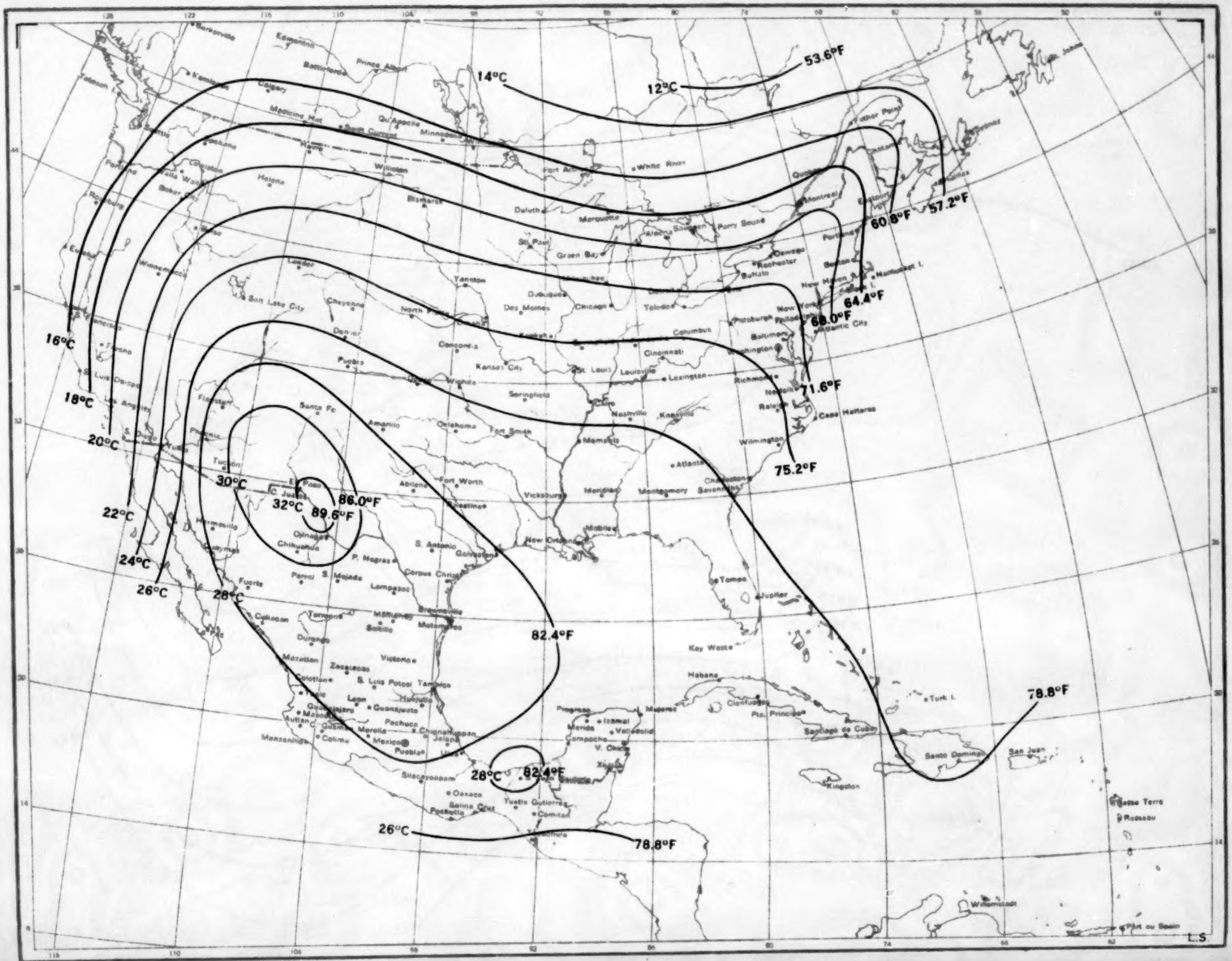
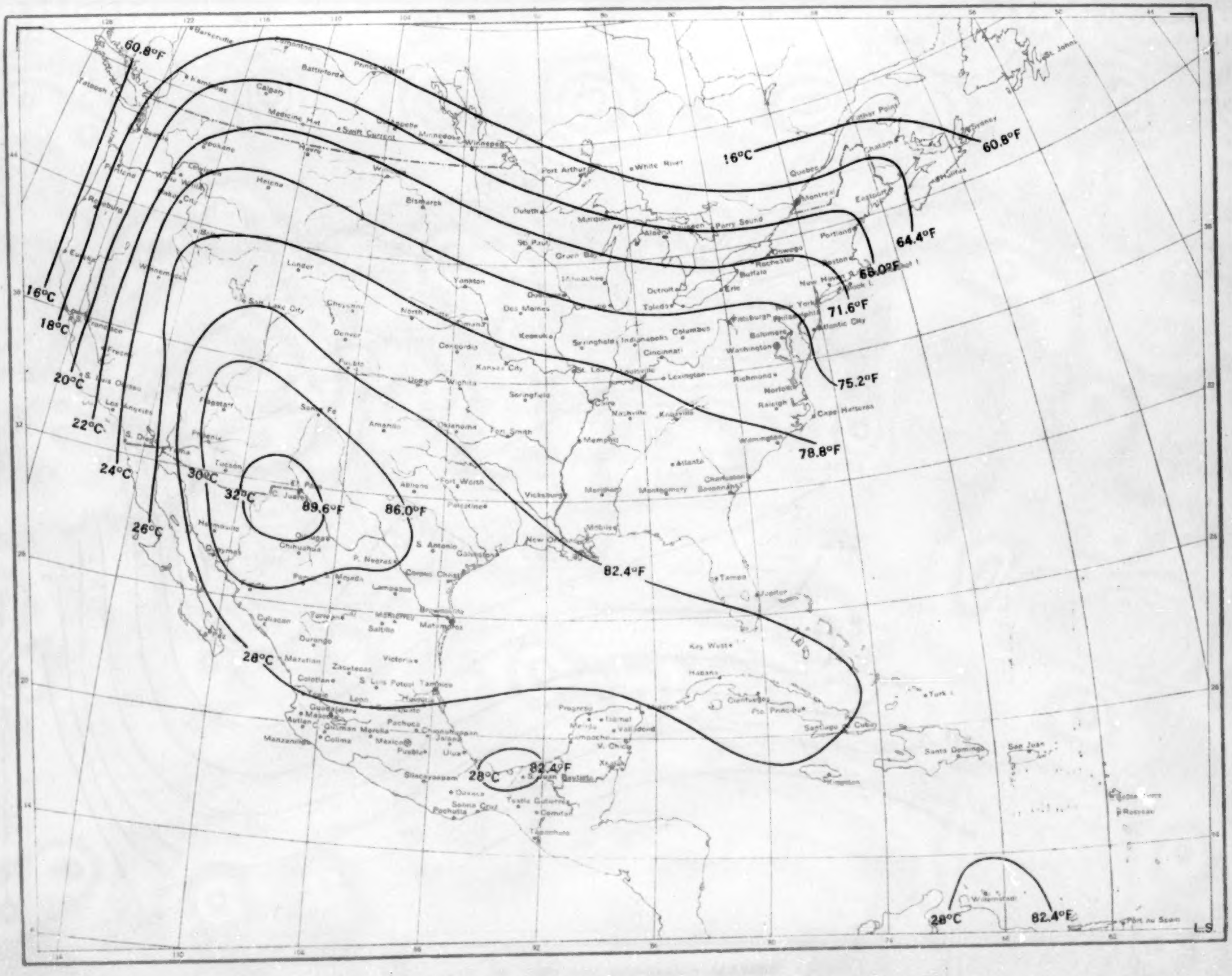


Fig. 69. Sea-level isotherms, July.



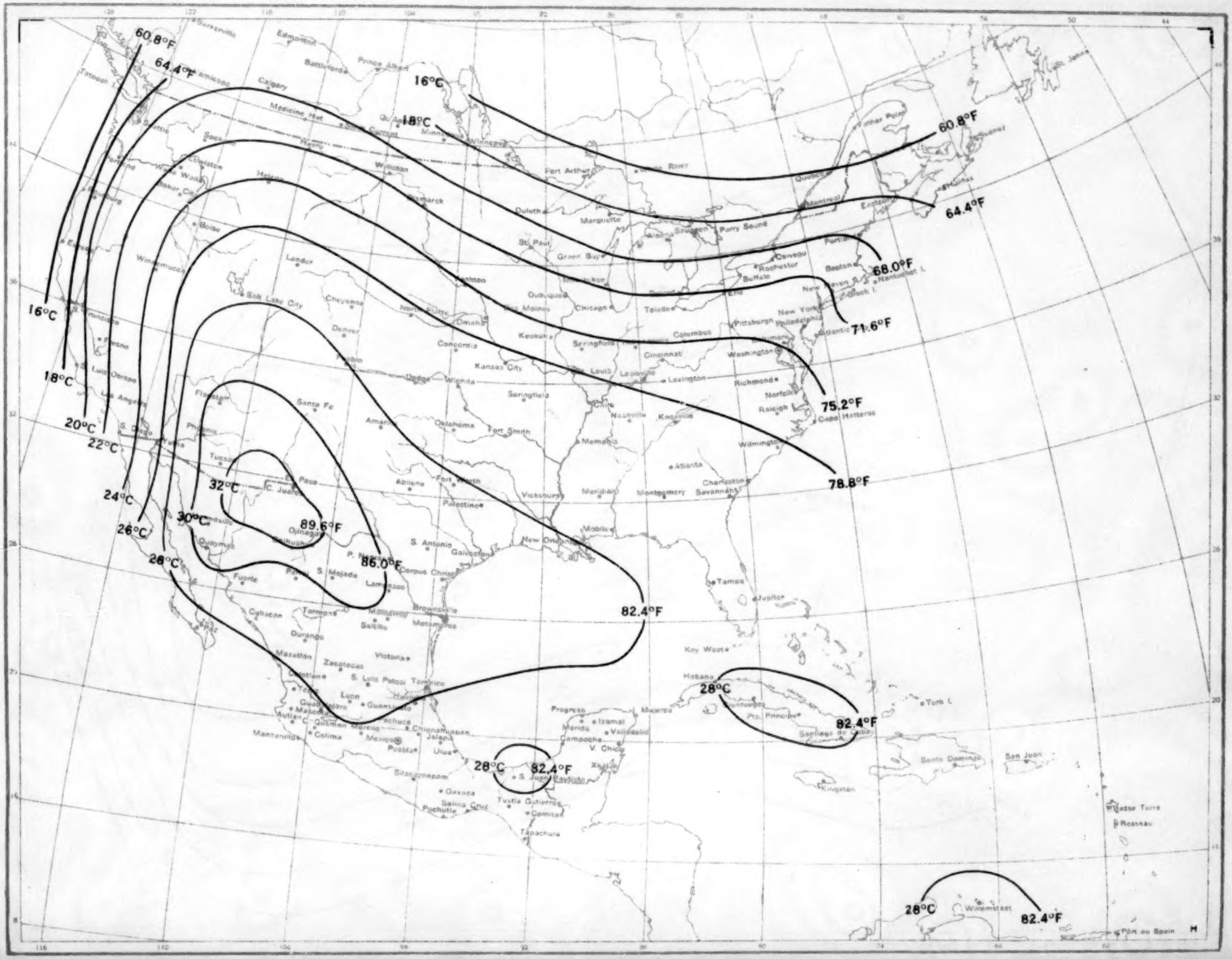


Fig. 70. Sea-level isotherms, August.

Fig. 71. Sea-level isotherms, September.

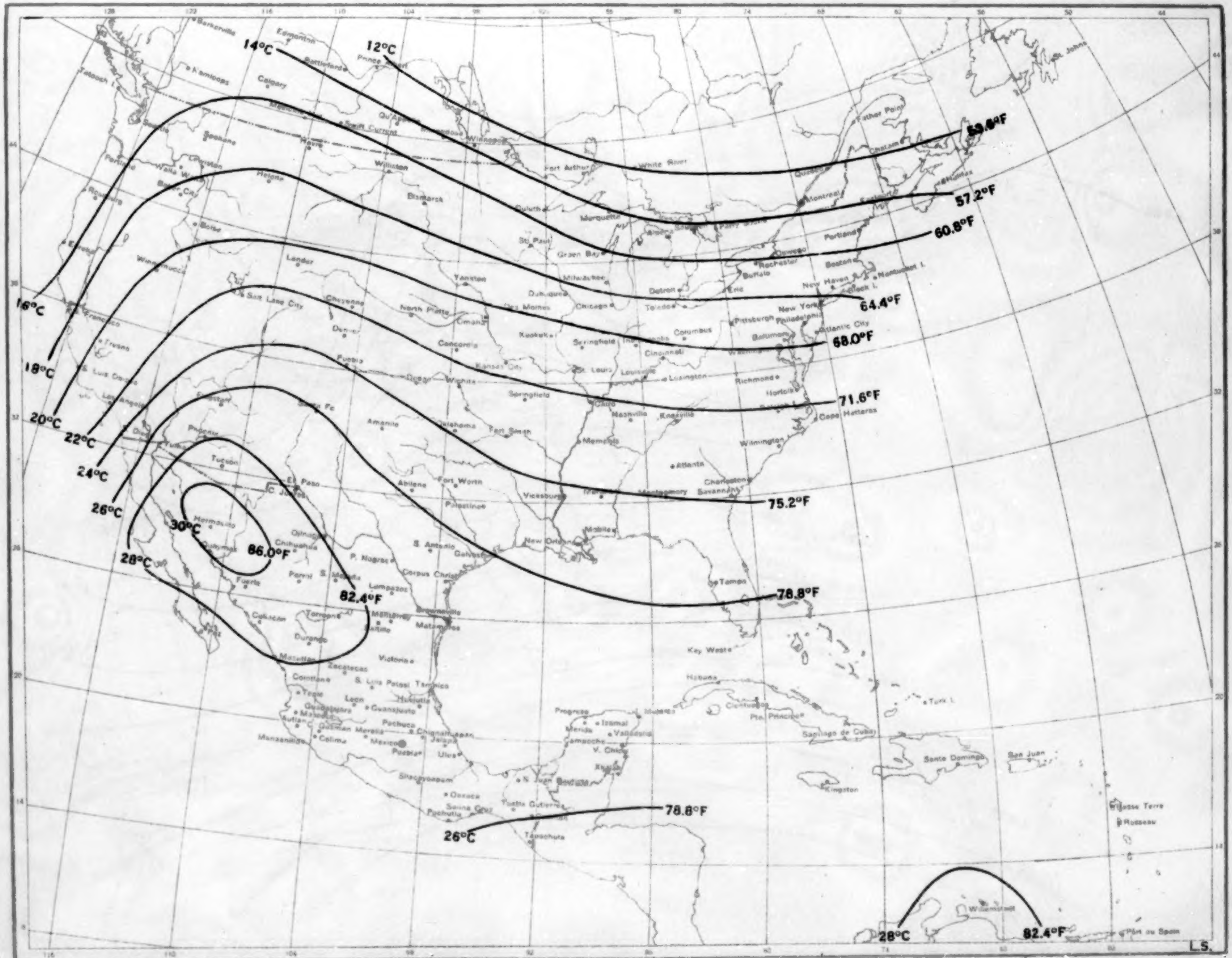


Fig. 72. Sea-level isotherms, October.

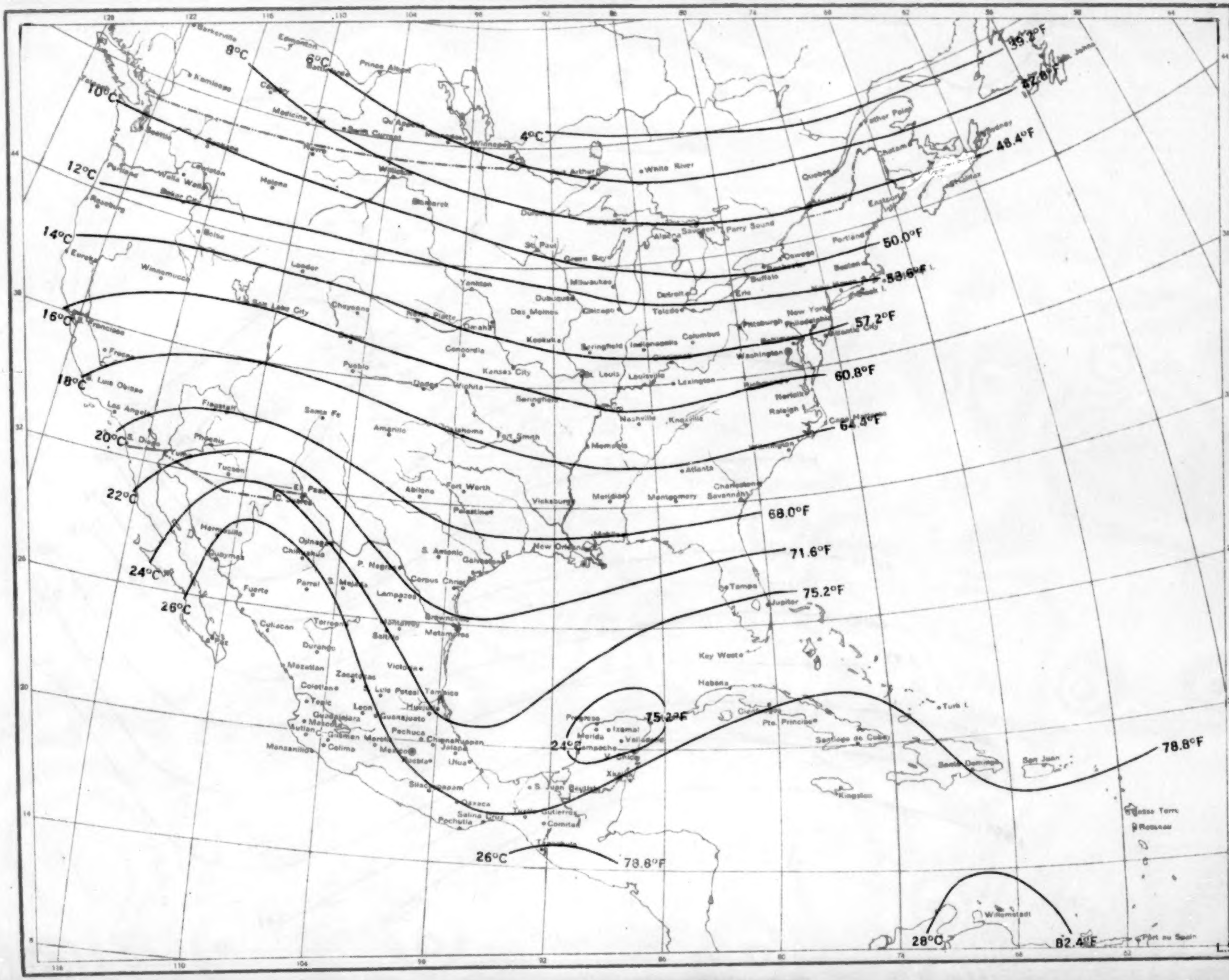


Fig. 73. Sea-level isotherms, November.

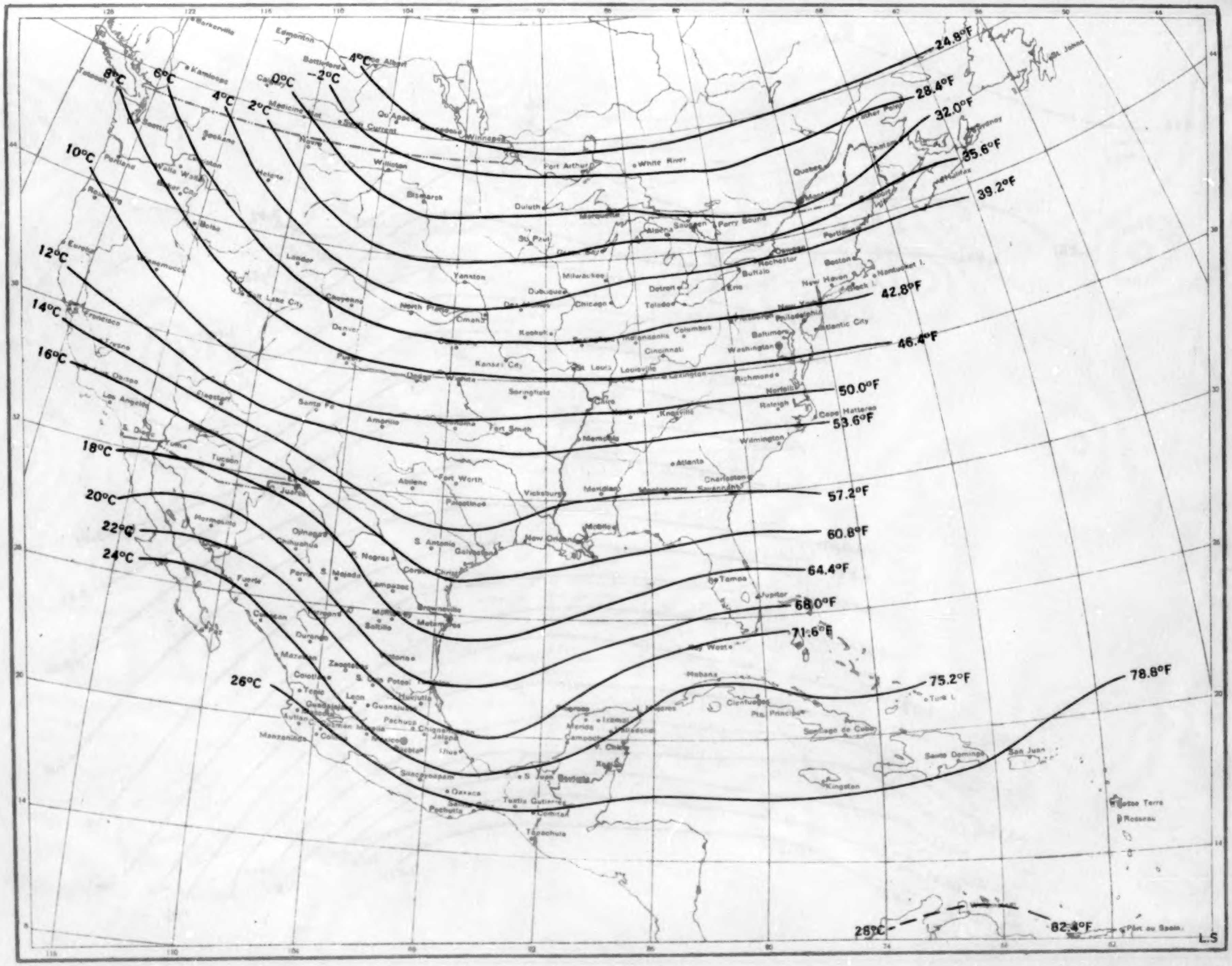


Fig. 74. Sea-level isotherms, December.

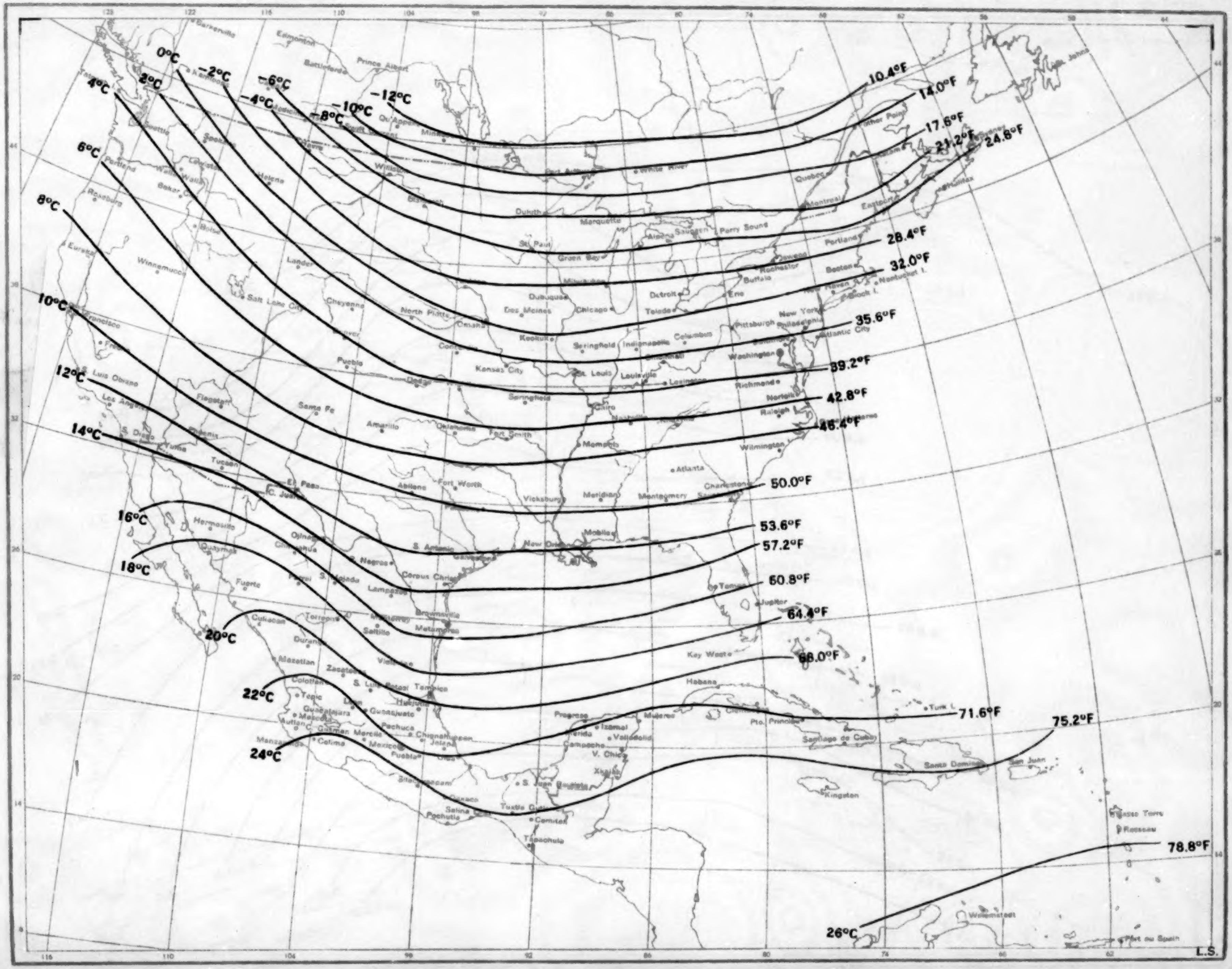


Fig. 75. Sea-level isotherms, Year.